Commercial Fisheries Abstracts

a monthly summary of important developments for the fishery industries

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Vol. 12 No. 2 February 1959

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Washington D.C.

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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0 General and theoretical	3 Preserved fish	7 Analytical Methods
1 Fish by species	4 Oils	8 Composition
2 Fresh fish	5 Vitamins	9 Miscellaneous
	6 Fishery byproducts	

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.118 ESTIMATION OF VACUUM IN UNOPENED CONTAINERS

Davis, E. G. and Elliott, A. G. L. (C.S.I.R.O., New South Wales, Australia)
Food Technology 12, 473-478 (September 1958)

Introduction. --Internal vacuum is usually measured with a puncture gauge that destroys the can. In some instances, the estimation of vacuum without destroying the can is desirable. A number of instruments have been devised to accomplish this aim. These instruments measure vacuum by a method known as the flip test. The end of a sealed can moves as a diaphragm and is subjected to a gradually increasing external vacuum until the external pressure is low enough to make the can end flip from a concave to a convex position. The external vacuum at which the flip occurs is determined largely by the internal vacuum of the can. Internal vacuum also may be estimated by instruments that measure the movement of the can end to a point short of flipping.

Purpose. -- This paper is concerned with a patented vacuum tester of the flip type that measures the movement of the can end to a point short of flipping. The patented vacuum tester was designed in the authors' laboratory and assigned Australian patent number 209,624 on June 10, 1957. This tester gives a steady reading of the flip vacuum on a vacuum gauge. Data presented below show a relationship between flip vacuum as measured with this tester and internal vacuum as measured with a puncture gauge.

Description. -- The tester is designed so that when the can end moves under the influence of an external vacuum it contacts the pin of an air valve, which admits air so that a steady state is reached in which the external vacuum is balanced against the internal vacuum of the can. A perspective view and a sectional drawing are included in the original publication.

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 ABSTRACTER: Martin Heerdt

0.5 THE EFFECT OF SALICYLIC ACID, BENZOIC ACID, AND SOME OF THEIR DERIVATIVES ON OXIDATIVE PHOSPHORYLATION

Bosund, Ingmar (Swedish Institute for Food Preservation Research, Gothenburg, Sweden)
Acta Chemica Scandinavica 11, 541-544 (1957) SIK-Publication No. 126

The growth-inhibiting effect of salicylic and benzoic acids on micro-organisms has been studied to elucidate the mode of action of these compounds. Recent thinking suggests the possibility that the growth-inhibiting effect may be related to an inhibition of the formation or utilization of high-energy compounds by the organism. Accordingly, the author has studied the effect of salicylic and benzoic acids and some of their derivatives on the oxidative phosphorylation in isolated rat-liver mitochondria.

Analytical procedures. --Oxygen consumption was measured by the conventional Warburg technique. Suspensions and neutralized solutions of the different inhibitors were added to the main compartments of the Warburg vessels, substrates and hexokinase to the sidearms. The center wells contained 0.2 ml. 2M KOH absorbed on a roll of filter paper. The final volume of the solution in the vessels was adjusted to 2 ml. with 1.15 percent KCl. Manometer readings were taken at 5-minute intervals, starting 5 minutes after the addition of substrate and hexokinase from the side-arms. Oxygen consumption for the period 0 to 5 minutes was calculated by extrapolation. At the end of the experiments, enzymatic activity was stopped by adding 0.2 ml. of 5M sulfuric acid. The phosphate uptake was determined as the ratio of organic phosphate formed to inorganic phosphate added by the isotope distribution method described by Lindberg and Ernster (1956).

Results. --Salicylate at a concentration of about 1×10^{-2}M almost completely inhibited phosphorylation when α-ketoglutarate was used as the substrate, whereas the inhibition of oxygen consumption was negligible. Similar results were obtained when α-ketoglutarate was replaced by

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 ABSTRACTER: Kathryn L. Osterhaug

0.321 OXYGEN LABILITY OF CYSTEINE IN HEMOGLOBIN

Tsen, C. C. and Tappel, A. L.
Archives of Biochemistry and Biophysics 75, 243-250 (May 1958)

Purpose. --This study was made to obtain additional information about the direct oxidation of the protein portion of hemoglobin and to determine which of the amino acids of hemoglobin protein are most subject to oxidation.

Experimental. -- A solution of cattle hemoglobin was prepared by the method of Marri and Singer (1955). Sulfhydryl reagents, mercuric chloride, iodoacetate, and chloromercuribenzoate were added to the hemoglobin solution. The solution then was freeze-dried, pulverized, and equilibrated under nitrogen to a water-vapor pressure of 11 millimeters (mm.) of mercury. Pure amino acids were dissolved or suspended in ferric chloride solution, freeze-dried, and also equilibrated to a water-vapor pressure of 11 mm. of mercury.

Oxygen absorption of the dry hemoglobin prepared above was measured manometrically in Warburg flasks wrapped with aluminum foil to exclude light. Sulfhydryl groups of the dry hemoglobin were measured by the method of Benesch, Lardy, and Benesch (1955). The ratio of methemoglobin to total hemoglobin was determined by the method of Michel and Harris (1940). Total soluble nitrogen was extracted with 0.07 molar phosphate buffer (pH 7.0) and determined by the Kjeldahl method. Hematin was determined spectrophotometrically as the alkaline pyridine hemochrome. The complete visible spectrum of the extract obtained with the 0.07 molar phosphate buffer was measured, and the loss due to oxidation was determined from absorbance at 500 millimicrons.

Results. -- Hemin and the oxygen-labile amino acids in the presence of ferric chloride were

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 ABSTRACTER: Martin Heerdt

1.0115 GLOUCESTER'S TRAWL FISHERY FOR INDUSTRIAL FISH

Edwards, Robert L. (U. S. Bureau of Commercial Fisheries, Woods Hole, Massachusetts)
Commercial Fisheries Review 20, 10-15 (August 1958)

The term "industrial fish" as used here refers to those species commonly taken by trawlers and referred to as "trash fish." They are taken along with desired food species and sold separately for reduction to fishery byproducts or meal plants.

Table 2 lists the percentages by weight of all species landed as trawl industrial fish from each of the three areas discussed. These figures are based on all the samples available and are not weighted according to the landings of individual months. They represent only an approximation, therefore, of the actual breakdown in percentage by weight of the landings.

Table 2. --Percentage by weight of species composition of the trawl industrial fish landings at Gloucester from the three principal areas.

Species	Area and period covered		
	Nauset (May-Nov.)	Stellwagen (June-Jan.)	Gloucester (May-Nov.)
Red hake	57.5	33.8	43.9
Whiting	21.7	39.1	13.3
Eelpout	5.1	1.6	2.6
Alewife	3.4	2.6	9.3
Haddock	2.7	1.8	2.9
Herring	2.7	2.2	2.0

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FLIP TYPE VACUUM TESTER

OXYGEN LABILITY OF HEMOGLOBIN

GROWTH INHIBITION OF MICROORGANISMS

TRAWL FISHERY FOR INDUSTRIAL FISH

0.321

exposed to oxygen in the dry state to learn what part of the hemoglobin molecule is responsible for oxidation. Cysteine and histidine were shown to be oxygen-labile. The oxidation product of cysteine is cystine. A significant loss of sulfhydryl groups in hemoglobin also occurred after oxidation. The largest portion of the oxygen uptake can be inhibited, however, by blocking the sulfhydryl groups. The degree of inhibition is related to the number of sulfhydryl groups that are blocked. The sulfhydryl group of hemoglobin is more labile to oxygen both in solution and in the dry state than is any other group. The rate of oxidation increases (a) in the dry state with an increase in temperature and (b) in solution with an increase in the pH of the hemoglobin solutions before they are freeze-dried.

Conclusions.--This study extends and confirms the work of others who have shown that hemoglobin is very labile to oxidation. A significant loss in the solubility of the oxidized dry hemoglobin indicates denaturation of the protein.

0.118 (Cross Reference: 3.338)

Operation.--To operate the tester on a can with an internal vacuum, the height of the valve pin is adjusted to a point a little above the can end. A 3-way tap in the vacuum line is then turned to connect the vacuum source, and a small chamber formed on top of the can. As this chamber is evacuated, the flexible end of the can moves up and contacts the valve pin. Slight upward pressure on this spring-loaded pin opens the valve and admits air from the atmosphere through a central tube. A jet in the vacuum take-off limits the rate of removal of air by the vacuum pump. By this time the valve, opening automatically, adjusts to admit air from the atmosphere at the same rate. The end point of the estimation appears as a steady reading directly from the vacuum gauge. With most canned foods, vacuum readings are reproducible between separate readings made at any one time. Calibration of the tester on a can at atmospheric pressure is required. A more accurate method of adjustment can be obtained with a special calibration device.

Experimental.--Vacuum was measured in canned test products packed in 301 X 411 cans made from two types of tin plate. The relationship between internal vacuum in the cans and flip vacuum was determined with specially prepared cans of the same size that had been connected to a water pump and mercury manometer with copper tubing. Vacuum levels of 0 to 24 inches of mercury in increments of 2 inches were drawn on each can, and flip vacuum was estimated with the patented instrument. Care was used to avoid loss of water from these test cans during evacuation.

Results.--The results, as analyzed statistically, showed that if the tester was used in conjunction with a calibration curve, the internal vacuum of the cans could be estimated within a standard deviation of 1.3 inches of mercury. Measurements of individual cans over a period of time showed that the changes in flip vacuum were very nearly proportional to the change in internal vacuum over the range 0 to 24 inches of mercury. For practical purposes a linear relationship may be used. The standard deviation in these estimations was 0.6 inches of mercury.

1.0115

Table 2.--Percentage by weight of species composition of the trawl industrial fish landings at Gloucester from the three principal areas.

Species	Area and period covered		
	Nauset (May-Nov.)	Stellwagen (June-Jan.)	Gloucester (May-Nov.)
White hake	1.7	1.0	0.8
Big skate	1.6	-	0.5
Spiny dogfish	1.5	1.9	3.0
Dab	1.1	5.1	3.7
Little skate	0.4	0.5	1.0
Longhorn sculpin	0.4	0.3	0.2
Shad	0.3	0.2	2.0
Sea raven	0.3	0.1	-
Barndoor	0.2	0.1	2.2
Fourspot flounder	0.1	-	-
Rockling	0.1	2.1	0.3
Yellowtail	0.1	-	-
Cod	0.1	0.1	0.3
Sea eel	0.1	0.6	-
Ocean perch	0.1	1.2	1.3
Pollock	0.1	0.1	-
All others	0.3	0.5	0.1
Angler	-	4.3	10.2
Blackback		0.1	0.2
Grey sole	-	0.5	0.2
Number of samples	63	21	20

0.5

pyruvate plus malate, succinate, or glutamate.

Benzoate was found to have a similar effect but only at concentrations greater than that necessary for the salicylate. The results of a typical experiment with benzoate are given in table 2. The relatively high concentrations of benzoate caused a partial inhibition of respiration in conjunction with the effect on phosphorylation. The respiration could be brought up to the original level by the addition of DPN and cytochrome c without a simultaneous recovery of the phosphorylation. The inhibition apparently is a secondary effect caused by the release of DPN and cytochrome c from the mitochondria.

Discussion.--It is evident that salicylic and benzoic acids produce an effect on oxidative phosphorylation similar to that obtained with 2,4-dinitrophenol. The concentrations required to obtain a marked effect are of the same magnitude as are those required for complete suppression of bacterial growth at pH 7.5.

Table 2.--The effect of benzoate on oxidative phosphorylation.

Additions	Without hexokinase	With hexokinase	
	Oxygen μatoms	Oxygen μatoms	P/O ratio
None	3.5	12.3	2.1
DPN + cytochrome c	6.7	12.2	2.0
Benzoate	8.2	10.7	1.0
Benzoate + DPN + cytochrome c	8.7	12.1	0.9

0.5 NUTRITION AND METABOLISM OF MARINE BACTERIA. I. SURVEY OF NUTRITIONAL REQUIREMENTS. II. OBSERVATIONS ON THE RELATION OF SEA WATER TO THE GROWTH OF MARINE BACTERIA. III. THE RELATION OF SODIUM AND POTASSIUM TO GROWTH

MacLeod, Robert A.; Onofrey, Eva; and Norris, Margaret E. (Pacific Fisheries Experimental Station, Vancouver, B. C.)
Journal of Bacteriology 68, 680-686 (December 1954); II. Ibid. 71, 661-667 (June 1956); III. Journal of Cellular and Comparative Physiology 50, 389-402 (December 1957)

I. Survey of nutritional requirements. -- A general survey has been made of the nutritional requirements of 33 marine bacteria isolated from sea water, from clams, from the surface of fish, and from the gut of fish. The largest numbers of the organisms belong to the genera Mycoplana, Corynebacterium, and Flavobacterium. Nineteen were able to grow in a medium containing a mixture of inorganic ions, in any one of several organic compounds as a source of carbon and energy, and in ammonium sulfate as a source of nitrogen. Seven organisms, when tested, grew only feebly or not at all except when certain amino acids or combinations of amino acids were supplied as sole sources of carbon and energy. Four organisms required amino acid supplements in addition to a non-amino acid source of carbon and energy. Five of the bacteria grew only in the presence of one or more vitamins or other growth factors. One of the latter organisms requires a still unidentified factor for growth.

Those organisms that required sea water in the medium on initial isolation grew if sea water was replaced by a mixture of salts approximating the composition of sea water. All of the organisms tested for K^+, Mg^{++}, and in some cases also for Na^+ and Ca^{++}, required growth factor(s).

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 ABSTRACTER: Martin Heerdt

2.02 SLOW FREEZING OF CARP MUSCLE AND INOSINIC ACID FORMATION

Saito, Tsuneyuki and Arai, Kenichi (University of Hokkaido, Hakodate, Japan)
Archives of Biochemistry and Biophysics 73, 315-319 (February 1958)

Introduction. --When carp muscle is frozen slowly (-8° C. for periods up to 28 hours), the amount of adenosine triphosphate (ATP) in the muscle decreases and inosine monophosphate (IMP) increases. Evidence for the identification of IMP and a discussion of the pathway of breakdown are given in this report.

Methods. -- The dorsal muscle from cultivated carp was stored at -8° C. in an ice chest. One gram of the frozen muscle and 1 gram of fresh muscle were homogenized with 20 ml. of 4-percent perchloric acid solution at low temperature, and the insoluble materials were removed by centrifugation. The supernatant solutions were separated into fractions A, B, C, D, E, and F by ion-exchange using Amberlite IRA-400. The IMP content of fraction D was neutralized to pH 7.0, concentrated under reduced pressure, absorbed on a Norit column, washed with water, and eluted with 50-percent ethanol containing 0.01 M NH_3. The eluate was evaporated to dryness under reduced pressure, and the residue was dissolved in water. This solution was assayed (1) for IMP on the basis of its extinction coefficient at 250 mμ, (2) for ribose by the orcinol method, and (3) for phosphate by the method of Fiske and Subbakow. Hydrolysis products of IMP and of the nucleotide in fraction D were compared by paper chromatography.

Results. --The ratios of optical density D_{250}/D_{260} and D_{280}/D_{260} for fraction D and standard IMP corresponded closely at several levels of pH to indicate that fraction D was IMP. R_f values obtained from paper chromatography of fraction D and from hydrolyzed fraction D agreed closely with those of IMP and hypoxanthine.

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 ABSTRACTER: Herman S. Groninger

1.017 AUSTRALIAN PRAWN TRAWLING INDUSTRY'S PROMISING FUTURE

Anonymous
World Fishing 7, 30, 31 (October 1958)

For 60 years prior to 1947, the Australian commercial prawning operations were confined to estuaries and coastal lakes. The yield was sufficient merely to supply the home market.

With the expansion of the fishery to include the immense prawning grounds off the coast of New South Wales and Queensland, catches now provide an excess of prawns for export.

Six species of prawns are of importance to the Australian industry. These are the (1) king prawn, (2) Western Australian king prawn, (3) tiger prawn, (4) banana or white prawn, (5) greentail or greasyback prawn, and (6) school prawn.

The prawns are fished by the use of otter trawl gear and seldom are caught at depths greater than 30 fathoms. Unless the vessel is rigged with fore and aft gallows, the trawl is shot and hauled over the stern. At the end of each haul, the cod end is lifted over the side and on to the after deck, or the prawns are emptied onto a sorting table. Mud and sand carefully are washed from the cod end before it is lifted from the sea.

After the prawns have been sorted, they are washed carefully in tanks of running sea water and placed in an insulated hold with crushed ice. Coarse salt sometimes is scattered among the prawns while they are being iced down.

At the end of each day, most of the trawling vessels return to port where the prawns are weighed, cooked (if green), and packed in crushed ice for consignment to market or are held for further processing.

The trawls in general use are made of comparatively light cotton--10/6 ply, 10/9 ply, 10/12 ply, and 10/15 ply in hard laid seine cotton and 32/18 ply and 32/24 ply in soft laid cotton. Cod ends are made from 32/36 ply or 52/48 ply soft laid cotton and 10/18 ply or 10/21 ply hard laid seine cotton.

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 ABSTRACTER: Kathryn L. Osterhaug

2.02 INTERMEDIATE METABOLISM OF ELECTRIC TISSUE IN RELATION TO FUNCTION. I. GLYCOLYTIC ENZYMES AND SUCCINIC OXIDASE

Eisenberg, Max A. (Columbia University, New York, New York)
Archives of Biochemistry and Biophysics 74, 372-389 (April 1958)

Introduction. --The electric organs of certain fish are the most powerful bioelectric generators created by nature. The characteristics of the electric discharge have been the subject of a great many studies for more than a century, and it has long been recognized that the nature of the electric discharge is fundamentally the same as that of ordinary action potentials of nerve and muscle. The energy required for reactions associated directly with electrical activity in ordinary nerves is small, and therefore chemical analysis is extremely difficult. The large amounts of electrical and chemical energy released during the discharge of electric organs and their highly specialized nature in regard to function make these tissues most suitable materials for the study of chemical reactions underlying the generation of bioelectrical potentials.

Purpose. -- This paper is the first of a series devoted to the intermediary metabolism of electrical tissue and to the exploration of those reactions which may be closely related to ion flux in rest or in recovery. The recent development of a preparation consisting of a single isolated electroplax in which two chambers of fluid are completely separated by a single cellular unit is particularly suitable for studies of ion flux across the conducting membrane. This preparation offers an unusual method for correlating metabolic reactions with functional processes.

Materials and methods. --AMP, ADP, and ATP^3 were products of Pabst Laboratories. Glucose 6-PO_4, hexose diphosphate, cytochrome c, and DPN were obtained from Sigma Chemical Co. DPNH was prepared according to the method of Beisenherz et al. (1953). Sodium pyruvate was a

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1.017

Legs from 2 to 5 fathoms in length, are used between the wing-ends of trawl and otter boards. These are generally the continuation of head and footropes, although in some cases chain is used to form the lower legs or both upper and lower legs. Irrespective of material used, the legs are shackled to the eyes of the hauling points at the back of the otter boards.

A very satisfactory type of winch is installed in the better-class prawn trawler. It is chain- or belt-driven through a power take-off from the main engine. In the short history of Australia's ocean prawning, a highly efficient overhead type of hauling gear has evolved. Peculiar to Australian prawning vessels, it is best situated just abaft of amidships.

Vessels that originally had been built for Danish seining, for trapping fish or crayfish, or for line fishing were rigged for participation in the newly discovered prawn fishery in its early stages.

With the increase of interest in ocean prawn trawling, however, vessels have been built specifically for this purpose, powered with a Diesel engine, and equipped with ship-to-ship and ship-to-shore radio. Two are provided with echo-sounders. Australian prawn trawlers range in size from a single-manned boat with deck 17 ft. 6 in. long to four-manned trawlers of about 70 ft.

Some indication of the importance of Australia's offshore prawn fisheries can be obtained from a glance at the undermentioned:

Total prawn production 1956/57

Queensland	2,500,000 lb.
New South Wales	2,386,180 lb.
Western Australia	189,218 lb.
Total	5,075,398 lb.

Australia's total prawn export for 1956/57 amounted to 317,377 pounds.

2.02

Schwarz company product, and all other compounds used were the usual commercial preparations.

All manometric procedures were carried out with the Warburg technique using air or 95 percent N_2-5 percent CO_2 as the gas phases. Spectrophotometric studies were performed with the model DU Beckman spectrophotometer. Lactic acid was determined by the Barker-Summerson procedure as modified by LePage (1945).

Results.--Appropriate methods were worked out for preparing extracts of electric tissue and for testing them for enzyme activity. All the enzymes of the glycolytic scheme from phosphoglucoisomerase through lactic acid dehydrogenase have been demonstrated to be present in electric tissue extracts with the exception of triosephosphate isomerase and 1,3-phosphoglyceric kinase. The presence of the two latter enzymes is indicated by the experiments on glycolysis with whole homogenates.

Some of the optimal conditions and cofactor requirements of glycolysis of electric tissue homogenates were worked out.

Succinic oxidase activity was studied in two types of electric organ, namely, the Bundle of Sachs and the main organ; the Q_{O2} average of these organs is respectively, 3.5 in the former and 2.1 in the latter. Succinic oxidase activity of electric tissue was compared with that in other conducting tissue (striated muscle, heart) and nonconducting tissue (kidney and liver). The succinic oxidase activity in electric tissue was as high as in striated muscle, but it was still higher in heart, kidney, and liver.

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II. Observations on the relation of sea water to the growth of marine bacteria.--The need of six marine bacteria for sea water in a chemically defined medium has been shown to be due to the ability of sea water to supply the inorganic ions required for growth. No evidence was obtained to show that sea water was capable of supplying unknown organic factors either required by or stimulatory for the growth of these organisms.

A supplement of iron in the sea-water medium increased both the rate and the extent of growth of all of the organisms tested. None of the organisms grew unless Na^+ and K^+ were added to the medium. Additions of Mg^{++} were required by four of the organisms and were stimulatory for the growth of the other two. Ca^{++} was required by one organism and stimulated the early growth of another. None of the organisms grew significantly without PO_4^{---} in the medium, whereas the absence of SO_4^{--} prevented the growth of four organisms and reduced the amount of growth of the other two. One organism required Cl^-, the growth of another was limited by its absence, whereas the remainder either were unaffected by its absence or needed Cl^- for optimum growth. Attempts to adapt two marine bacteria to grow in a complex medium prepared with fresh water instead of artificial sea water were unsuccessful.

III. The relation of sodium and potassium to growth.--For the three marine bacteria investigated, the levels of Na^+ and K^+ in the medium were found to affect both the rate and the extent of growth. Only one one-hundredth as much K^+ as Na^+ was required. Neither Li^+, Rb^+, nor Cs^+ permitted growth of any of the organisms when added in place of either Na^+ or K^+. Cs^+ was inhibitory for two of the organisms tested and antagonistic toward K^+. When growth of the organisms had been stopped by the level of either Na^+ or K^+ in the medium, analysis of the supernatant medium revealed that considerably more ions remained in the medium than were taken up by the cells. At suboptimum and optimum concentrations of Na^+ for growth, intracellular and extracellular Na^+ concentrations were nearly the same; whereas at the level of Na^+ in sea water, the extracellular concentrations exceeded the intracellular. If K^+ was present in the medium at the level found in sea water, the cells contained more K^+ per unit volume than the medium.

Attention has been drawn to a similarity between marine bacterial cells and animal cells in both their relationship between intra- and extra-cellular levels of Na^+ and K^+ and their quantitative growth requirements for these ions.

2.02

In a comparison with fresh carp muscle, frozen carp muscle showed very little ATP and only about 25 percent as much ADP as fresh muscle. IMP increased markedly and AMP (tentatively identified) also increased.

Discussion.--From this and from previous work it may be considered that muscle contraction and the concurrent breakdown of ATP and ADP occur until the muscles are frozen completely.

The most probable pathway for the formation of IMP is through the deamination of AMP catalysed by AMP-deaminase. AMP is formed from ADP through the action of myokinase, and ADP is formed by the ATPase catalysed hydrolyses of ATP. Since it is known that skeletal muscle AMP-deaminase activity is probably greater than that of ATPase, AMP may be converted to IMP almost as rapidly as it formed. As a result, IMP would accumulate whereas AMP would not increase as much as IMP.

2.114 THE NYLON PROPELLER IN 1958

Hojsgaard, Johannes (Hundested Motor Fabrik A/S, Hundested, Denmark)
World Fishing 7, 45-47 (September 1958)

During severe practical trials, the first nylon propeller blades were found to be exceptionally rugged and able to withstand use in heavy ice.

Nylon propeller blades are made by pressure-molding in a tight, highly polished mold at about 1,200 pounds of pressure per square inch and at a temperature of approximately 500° F. The molds are expensive, and they are economically possible only when a large number of similar propellers are to be manufactured.

For propellers larger than 18 inches in diameter, the expense of the pressure mold is such that it pays to manufacture a propeller head of bronze and insert blades of nylon. In addition to the strength of the nylon, these propellers offer the following advantages: (1) cavitation-free surfaces, (2) lower friction between blade and water, and (3) complete absence of electrolytic damage.

In order to obtain equivalent strength, the nylon blades must be thicker than their bronze counterparts. In spite of the extra thickness, tests of the 54-inch propeller showed that it was more efficient than was its bronze equivalent. The reason for this can be only that the friction between nylon and water is less than that between bronze and water.

The difference in weight between bronze and nylon also is important to fishermen. A typical propeller for a North Sea trawler has blades that weigh over 100 pounds when made of bronze; the same blades made of nylon weigh only 18 pounds. This difference in weight will have an important effect on the life of the clutch and stern bearing, and should extend the life of the latter significantly.

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ABSTRACTER: Kathryn L. Osterhaug

2.1471 STUDIES ON THE FISHING GROUND, FISHING GEARS AND FISHING TECHNIQUE IN ONE-BOAT MEDIUM TRAWL FISHERY

Saito, Ichiro (Faculty of Fisheries, Hokkaido University)
Memoirs of the Faculty of Fisheries, Hokkaido University 5, No. 1, 1-90 (1957)

This paper is concerned primarily with the Japanese one-boat medium trawl fishing, generally referred to as Danish seining. The application of Japanese echo sounders of type 3 and type 100 (14.5 and 14.2 K.C.) to fishing operations for use in navigation, bottom topography surveying, and fish detection is illustrated and discussed.

The density and vertical distribution of demersal fish in the depth range of 20 to 900 meters in the sea northwest of Hokkaido were sampled by a one-boat medium trawl. The authors found that the greatest variety and quantity of fish were found in depths ranging between 100 and 300 meters (50 - 150 fathoms). Sea water of 100 to 200 meters in depth is well circulated and easily penetrated by sunlight; therefore it contains an abundance of phytoplankton, zooplankton, and fish larvae that are suitable as feed for fish.

The commercial potential of the Musashi bank 50 to 80 miles west of the Teshio district of Hokkaido was evaluated after extensive echo-sounding and bottom sampling surveys had been made. As a trawling ground, the Eastern part of the Musashi bank and its surrounding waters was the most promising. The other parts of this bank were composed of large areas unsuitable for trawling.

In 4 years of experimental fishing with two 4-seam trawls of the Danish seine type that were designed to operate without doors, the authors found that the average catch was 1.7 times that obtained with the conventional Japanese one-boat medium trawl net. Setting this gear in the shape of an isosceles triangle rather than an equilateral triangle produced larger catches even though the

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ABSTRACTER: Frederick Wathne

2.116 A PRACTICAL DEPTH TELEMETER FOR MIDWATER TRAWLS

McNeely, Richard L.
Commercial Fisheries Review 20, 1-10 (September 1958)

A direct-reading electrical depth telemeter for midwater trawls has been developed and used successfully in the northeastern Pacific. The system utilizes an electrical trawl cable to transmit continuous depth information from a pressure-sensing unit on the gear to a pilothouse meter that shows trawl depth in feet and fathoms. Slip rings and brushes on the trawl winch complete the electrical circuit, which is powered by a 45-volt battery located in the control box in the radio-chart room. Maximum depth range of the system with the present potentiometer is 225 fathoms, but this can be increased or decreased as may be required.

Advantages of the system are its simplicity and practicability, requiring no extra handling on deck and no specially trained operator. It has been tested and used successfully during the spring and summer of 1957 aboard the U. S. Bureau of Commercial Fisheries exploratory vessel John N. Cobb based at Seattle.

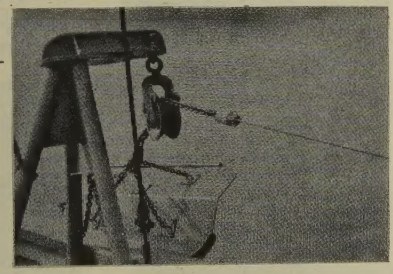

Figure 2.--Pressure-sensing unit attached to the end of the electrical trawl cable just in front of one of the trawl doors.

(over)

ABSTRACTER: Richard L. McNeely

2.15 CHANGES IN COMPOSITION OF SOLE DURING REFRIGERATION

Thurston, Claude E. (Fishery Technological Laboratory, Seattle 2, Washington)
Commercial Fisheries Review 20, 21-22 (August 1958)

Extensive changes take place in the mineral content of the fish flesh during storage in ice and in refrigerated brine. This article reports on the changes that take place in the composition of sand sole and of English sole.

Preparation of samples.--Sand sole and English sole, caught in Puget Sound by the University of Washington exploratory vessel The Commando, were stored in ice until they were landed at Seattle.

After they were landed, the fish were treated in two different ways: (1) Part of the fish from each species were filleted; the fillets then were ground and filled into ½-pound salmon cans, which were vacuum-sealed, frozen, and stored at 0° F. until the contents were analyzed. (2) The remaining fish of each species were placed in plastic bags that contained a 3-percent sodium chloride solution in the ratio of two parts of fish to one part of brine, by weight. The bags were sealed, immersed in a 3-percent solution of chilled sodium chloride, and kept at 30° F. Samples of the fish held in brine were removed at intervals of about 3 days over a period of 2 to 3 weeks. Fillets were removed from these samples, given an organoleptic examination, ground, packed in cans, and stored at 0° F.

Analytical procedure.--When all of the samples had been collected, they were analyzed for moisture, oil, protein, and ash by standard methods of the Association of Official Agricultural Chemists. The ash samples were analyzed for sodium and potassium by the procedure developed

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ABSTRACTER: Kathryn L. Osterhaug

NYLON PROPELLERS

DEPTH TELEMETER FOR TRAWLS

DANISH SEINING IN JAPAN

FISH STORED IN REFRIGERATED BRINE

2.116

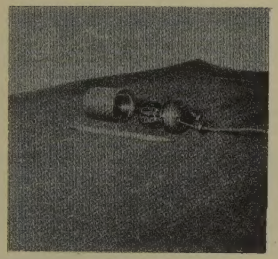

Figure 3.--Bronze pressure vessel with cap removed to show pressure potentiometer, feed-throughs, and "O" ring seal.

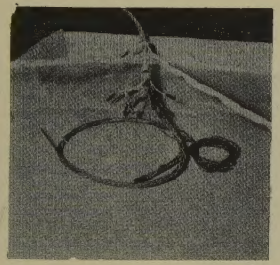

Figure 5.--Electrical trawl cable prepared for splicing, showing core, fillers, conductors, and the two layers of steel strands.

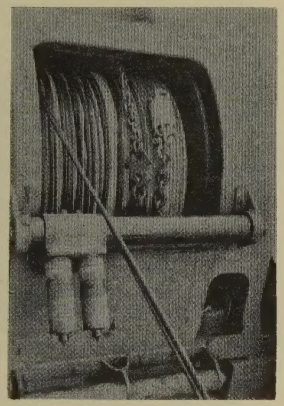

Figure 6.--Electrical trawl cable, midwater trawl bridles, and the telemeter sensing unit on winch of the John N. Cobb.

2.15 (Cross Reference: 8.42)

in the research laboratory of the National Canners Association.

Results and conclusions.--The original composition of both species of sole was typical for flatfish; namely, 81 percent moisture, 18 percent protein, less than 1 percent oil, and a little more than 1 percent ash. The content of sodium and potassium averaged 60 and 350 milligrams, respectively, per 100 grams of sample. Comparison of the composition of the samples stored in ice and in refrigerated brine showed very little change in moisture, oil, or protein. After storage in ice, the fish flesh showed a small loss of sodium and a large decrease in potassium and in total ash content. The fish stored in refrigerated brine were found to have absorbed a relatively large quantity of sodium and to have increased their total ash content by one-half. Some leaching of potassium was evident in the brine-held samples.

These studies indicate that there is extensive leaching of minerals during the storage of fish in ice, whereas storage in refrigerated brine involves an excessive uptake of sodium.

2.114

Another advantage of nylon is that a stranding or sudden blow to the propeller will partially be absorbed by the slight flexibility of the nylon blades, and less shock will be transmitted to the engine and propeller shaft.

2.1471

theoretical area encompassed is smaller. Setting the net in the shape of an isosceles triangle instead of an equilateral triangle required 33 percent less elapsed time before the forward movement of the net began, and considerably fewer fish were able to escape. The optimum water depth to warp length ratio was observed to be 13 to 15:1. The sinking velocity of the gear was found to be 12.75 meters per minute.

Direct underwater observation revealed that the warps dragging over the bottom raised a cloud of approximately 0.5 meter, whereas the net itself created a turbidity barrier 5 meters high. Operating the gear from the starboard side was more efficient than operating it from port side because of the effect of a standard right-handed propeller. Maneuvering while handling the gear is assisted rather than hindered, and the danger of fouling the gear in the propeller is minimized when fishing from the starboard side.

Echo-sounder observations of Alaska pollock in Ishihari Bay, Hokkaido, Japan, revealed that these fish appear in schools in midwater from 8 to 10 A.M., begin to sink about noon, reach the bottom about 2 P.M., and remain there, dispersed, until 5 to 7 P.M.

3.12 THE USE OF ANTIBIOTICS FOR THE CONTROL OF SPOILAGE IN THE EAST COAST FISHERIES PART I. INTRODUCTION AND THE USE OF ANTIBIOTICS ON GUTTED COD AND HADDOCK ABOARD TRAWLERS

Castell, C. H. and Greenough, Maxine F. (Fishery Technological Station, Halifax, Nova Scotia)
Canadian Fisherman 45, 6-8, 10 (October 1958)

In September 1956, the Department of National Health and Welfare legalized the use of the antibiotic chlortetracycline (CTC) as a preservative for fish in Canada. Since then, similar permission has been given for the use of a second antibiotic, oxytetracycline (OTC). Canada was not only the first, but up to the present time, is the only country that has permitted the use of antibiotics on fish.

Antibiotics are not equally effective on all marine products or under all conditions of storage and processing. This article is written primarily for the East Coast fishing industry and is confined to the results that have been obtained in Halifax in tests with CTC, and to a much lesser extent with OTC, on cod, haddock, and sole that were caught and processed in the Atlantic Maritime provinces.

Whole or gutted fish may be treated with antibiotics in several different ways: (1) they may be stowed in ice containing an antibiotic, (2) they may be dipped in an antibiotic solution, (3) an antibiotic solution may be sprayed on them, or (4) they may be held in tanks of chilled sea water containing a small amount of an antibiotic.

The experience of the authors has been limited to antibiotic dips.

CTC absorbed from dips. -- As might be expected, the amount of CTC taken up by the fish muscle from a solution is less with the whole or gutted fish than it was with the fillet. Much of the antibiotic remains in the skin and epithelial membranes, limiting the rate of diffusion into the muscle beneath.

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 ABSTRACTER: Kathryn L. Osterhaug

3.231 FROST ACTION UNDER COLD STORAGE PLANTS

Pearce, D. C. and Hutcheon, N. B. (Division of Building Research, National Research Council of Canada, Ottawa, Canada)
Refrigerating Engineering 66, 33-35, 74-76 (October 1958)

Introduction. -- Extensive frost heaving occurs only when water is drawn through the unfrozen portions of a soil to a surface within the soil at which freezing is taking place. Under these conditions, water migrates to the existing ice crystals, freezes, and contributes to the formation and growth of layers or lenses of ice. The growth of these lenses causes the frozen soil to increase excessively in volume and to heave. In this way, extremely high pressures can be developed, and even heavy buildings can be raised in elevation.

Frost heaving occurs only in certain soils, usually of fine-grained structure and said to be frost-susceptible. In these soils, "suction" can be developed to transport water to the freezing interface. For frost heaving to occur there must be a supply of water. Heaving can take place only as fast as the water can be drawn to and frozen at the freezing zone in the soil.

Freezing under storage buildings. -- A floor with 6 inches of cork insulation on a concrete slab laid on the ground is typical of many cold storage designs. If the cold storage temperature is -10° F. and the ground is at 32° F. below the slab the coefficient of conductivity, k, is about 0.28 Btu/ft^2/deg. F/in. Under these circumstances, heat will flow upwards from the ground through the floor slab and into the storage at the rate of 1.96 Btu/ft^2/hr. Unless heat is available at the bottom of the slab to replace the heat lost to the cold storage, the ground temperature will be lowered and freezing will occur.

The normal average temperature gradient of the soil is about 1° F. per 140 feet of depth. If k = 6.0 for the ground, the upward heat flow for this gradient will be 0.0035 Btu/ft^2/hr. This is an inadequate supply of heat to balance the heat that is lost through the slab to the cold storage, and freezing of the soil beneath the slab will result. The area covered by a cold storage affects the depth of frost penetration. The actual situation is so complicated, however, that only an approximate

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 ABSTRACTER: Martin Heerdt

3.12 THE USE OF ANTIBIOTICS FOR THE CONTROL OF SPOILAGE IN THE EAST COAST FISHERIES PART 2. THE EFFECT OF ANTIBIOTICS ON THE KEEPING TIME OF FILLETS

Castell, C. H. and Greenough, Maxine F. (Fishery Technological Station, Halifax, Nova Scotia)
Canadian Fisherman 45, 20-22 (November 1958)

In order to understand and interpret results of tests on the use of antibiotics to control spoilage in fresh fillets of fish, three things must clearly be understood.

1. It was assumed that most fresh-fish producers primarily are interested in increasing the time fish are of top quality rather than in increasing the length of time in the incipient spoilage stage. The definition of keeping time is limited to that period during which the fish remain free of all spoilage odors and are of top quality.

2. Organoleptic examinations of the fish by people trained as graders of fresh fish were used as the basis for judging freshness. Chemical tests and occasional bacterial counts were used to supplement the organoleptic judgments.

3. The purpose of the investigations was not to see how long antibiotics would preserve fish under laboratory conditions, but rather to discover their value under present-day commercial conditions, which involves the processing of fish that have been iced on board boats for 7 to 8 days before being filleted.

Experimental. -- Twenty-one lots of commercially prepared fillets were dipped in various concentrations of chlortetracycline (CTC) solution and stored at either 32° or 30° to 35° F. The fish

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 ABSTRACTER: Kathryn L. Osterhaug

3.2382 ECONOMIC METHOD OF PACKAGING

Anonymous
Fisheries Newsletter 17, No. 9, 13 (September 1958)

A method of packaging frozen fish, which involves the manufacture of polyethylene as used and is said to extend greatly the storage life of the product, has been patented in the United States. The patent was applied for by the chairman of the Danish Association of Producers of Flatfish, who is also president of a firm producing frozen and canned fish at Esbjerg.

The new method works as follows: The frozen product passes on a conveyor belt from the freezer directly to a polyethylene extruder, which has a special exhauster which covers the product with a polyethylene film produced at the instant of wrapping. The product can continue on the same belt directly to the storage room.

Due to the enormous difference in temperature between the polyethylene film, which is produced at a temperature of 356° F., and the frozen product, which has a temperature of minus 22° F., the heat of the polyethylene has the effect of destroying a good deal of surface bacteria, without damaging the product, since this difference of temperature exists for only a fraction of a second. As the product is passed out of the extruder, the air is evacuated from the polyethylene tube which is heat sealed at both ends.

Because of the characteristics of polyethylene the object appears as a glazed polyethylene inclusion. It is reported that this has the same effect as perfect glazing without any risk that this seal can become diminished by the influence of air or freezing. In addition, there are the advantages inherent in having the product polyethylene-enclosed.

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ANTIBIOTICS FOR GUTTED FISH

ANTIBIOTIC FOR FISH FILLETS

FROST HEAVING

EXTRUDED FILM FOR FREEZING

3.12

purposely were selected to show how the variation in initial quality affected the substantial keeping time.

Results.--It was of interest first to note the large differences in the keeping time of the control or untreated fish, which ranged from 3 to 11 days at 32° F. When 10 p.p.m. CTC was used in the dipping solution, the keeping time was just about double that of the untreated fillets. The results also indicate that the initial quality of the fish at dipping time is of more importance than is either the concentration of the dip or the length of time the fish are immersed.

Because of the wide and enthusiastic publicity given to antibiotics shortly after they became available in Canada, some processors failed to realize the limitation of these compounds. Fish that had been treated with CTC were held beyond their normal keeping time, and customers bought well-advertized fish that were spoiled or spoiling. This illustrates the exaggerated idea of the value of antibiotics that resulted from the enthusiasm of "popular" articles published at that time.

3.12

This means that a considerable proportion of the antibiotic is removed when the fish is cut and skinned to produce the fillet.

Medium-sized gutted haddock were dipped for 1 minute in solutions containing 4, 8, 20, 40, and 80 p.p.m. of CTC. Immediately after they were dipped, fillets cut from these fish showed no measurable amount of antibiotic. After 6 days in ice, fillets were again cut from the gutted fish and tested for CTC. The results are shown in table I.

In the tests made with whole or gutted fish, the keeping time has been defined as that period during which Grade I fillets (showing no off-odors or other signs of deterioration) can be cut from the fish.

Table II (omitted) gives the results from 12 different sets of tests where gutted cod and haddock were dipped into CTC solutions ranging from 4 to 80 p.p.m. In each case, the immersion time was 1 minute, and the fish were stored in chipped ice. The results suggest that for gutted fish, dips containing 5, 10, or 25 p.p.m. CTC are insufficient. Better results are obtained with 50 to 100 p.p.m., and even with 50 p.p.m. we cannot expect better than a 3- to 5-day increase in keeping time.

The usual concentration of either CTC or OTC in ice used for preserving fish is 5 p.p.m. For several days after gutted cod or haddock have been stowed in this ice, very little antibiotic penetrates into the muscle. Following this, there is a very slow buildup, but even after fourteen days the average content per fillet is less than 0.5 p.p.m.

Table I.--Average value from fifteen fillets.

CTC content of dipping solution (pm)	CTC content of skinned fillets cut from gutted fish (p.p.m.)
4	0
8	0
20	trace
40	0.080
80	0.130

3.2382

This method of packaging can cut down investment tied up in a variety of sizes of packaging, according to the inventor.

3.231

solution to the existing relationship can be obtained.

Thickness of insulation to prevent freezing.--The thickness of insulation required to prevent freezing below the slab can be determined by the use of the equation:

$$T(z) - T_m = \frac{T_o - T_m}{\left(1 + \frac{21}{r_o}\frac{K_g}{K_i}\right)} \left(\frac{1 + 2z^2}{r_o^2} - \frac{2z}{r_o} \frac{\sqrt{1 + Z^2}}{r_o^2} \right)$$

in which T(z) is the minimum soil temperature at depth "z" feet; T_m is the mean soil temperature; T_o is the cold storage temperature; 1 is the thickness of the insulation (feet); r_o is the equivalent radius of the slab (feet); K_g is the thermal conductivity of the soil; K_i is the thermal conductivity of the insulation. This equation can be solved for the thickness of insulation which will yield T = 32° F. when z = 0. This equation also shows that the depth of frost penetration varies directly with the ratio $(T_m - T_o)/(T_m - 32)$. The thickness of insulation required to prevent freezing is proportional to the equivalent radius of the structure. Thus a cold storage of 100 X 100 feet would require about 3 feet of insulation to prevent freezing. If only 6 inches of insulation were provided, the depth of frost penetration eventually would be about 18 to 20 feet.

Freezing not always serious.--Coarse sand, gravel, rock, or soil that is always extremely dry is not subject to frost heaving since both a frost-susceptible soil and a source of water in the soil are required.

Ventilated and heated floors.--Freezing of the soil can be greatly modified by using elevated floors, by providing ventilated crawl spaces, or by introducing heat in a variety of ways into the soil beneath the slab. Cost is the main disadvantage of elevated floors or floors constructed with crawl spaces for ventilation under the floor. The simple calculation made of the heat transfer through a slab insulated with 6 inches of cork with 32° F. on one side and -10° F. on the other yielded a heat flow of 1.96 Btu/ft^2/hr. This amounts to 17,150 Btu per sq. ft. of floor per year. At domestic fuel rates, heat would cost about 2 ½ cents per sq. ft. per year. To this must be added the yearly cost of the capital investment in the equipment necessary to deliver the heat below the slab plus the yearly cost of maintenance and operation of this equipment.

3.2382 POUCH PACKAGING ON UPSWING

Anonymous
Frosted Food Field 27, 34-36 (October 1958)

An increasing number of packers of frozen food now are converting to pouches, including plastic or paper boil-in-bag containers. The use of pouches has been prompted by the demand for convenience. In addition to their convenience, the pouches help retain freshness and flavor by sealing out air.

In addition to plastic boil-in-bag pouches, a foil pouch is available that can be subjected to direct heat by the use of a toaster, an oven, or a grill.

The advantages claimed for the flexible plastic pouch include the following: (1) flavor remains natural; (2) no vitamins or nutrients are lost; (3) cooking odors are eliminated; (4) there is no appreciable loss of weight during cooking or heating, since there can be no evaporation; (5) package does not float, so cooking is even; (6) rate of freezing is quicker because there is no insulating layer of air present; (7) with a vacuum, there is a tight cling; (8) no ice forms; (9) there is visual display of actual product in cabinets; (10) there is no fogging; and (11) cooking time is shorter, since the vacuum-sealed pouch acts as a pressure cooker.

Various types of frozen food are suitable for this type of packaging. The following are examples of what can be done:

1. Shrimp are said to be an ideal product for this package. The package is a self-contained unit, and the housewife can prepare the shrimp without any odor penetrating the home. The trouble at present, however, is that shrimp processors can sell all they can pack in any form. Two packers are using the Flex-Vac process for shrimp.

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ABSTRACTER: Kathryn L. Osterhaug

3.5 THE SURVIVAL OF CLOSTRIDIUM BOTULINUM IN CURING BRINES

Pedersen, H. O. (Division of Laboratory and Research, Muncipal Department of Health, Frederiksberg Raadhus, Copenhagen, Denmark)
The Microbiology of Fish and Meat Curing Brines, Proceedings of the Second International Symposium on Food Microbioloby, 1957. Department of Scientific and Industrial Research, pp. 289-293, (1958) (London, England)

Because of the wide distribution of Cl. botulinum in nature, a certain risk exists of coming upon its spores anywhere, including curing brines used for the preservation of food. The purpose of the present experiments was to investigate whether the brines contain compounds that during the period of curing can kill the spores, disturb their germination, or affect the toxin-producing mechanism of the vegetative cells.

Experimental brines.--The experiments with spores of Cl. botulinum were carried out with six brines used for curing hams and herring. The brines were sterilized by filtration before adding the spores of Cl. botulinum. Three different types of Cl. botulinum were tested--one A strain, one B strain, and two E strains. The A and B strains were incubated at 37° for six days, and the E strains at 30° for the same time. The spores then were separated from the medium by centrifuging and suspended in phosphate buffer at pH 7.0. The suspensions were heated in a water bath to make sure that the vegetative cells were killed: the A and B strains for 15 minutes at 70° and the E strains for 30 minutes at 65°.

The different types of spores were added to the brines in comparatively small numbers, to give counts of between 100 and 1600/ml. The brines containing spores were kept at 10° during the experiments, which lasted for 30 to 31 days. For each of the spore-holding brines, the number of spores per ml. was recorded five times: the first count shortly after the addition of the spores to the brines, the last 30 to 31 days later, and the others at convenient intervals between. The A and B types were incubated at 37° for 7 days before reading, whereas the E types were incubated at 30° for the same

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ABSTRACTER: Kathryn L. Osterhaug

3.337 A REVISED TABLE OF THE P_h FUNCTION OF BALL AND OLSON

Hicks, E. W. (Commonwealth Scientific and Industrial Research Organization, Homebush, N.S.W., Australia)
Food Research 23, 396-400 (July-August 1958)

Ball and Olson in their book, Sterilization in Food Technology. 1957. McGraw-Hill Book Company, New York, N. Y., have developed a new formula for calculating canning processes that has many important advantages over the older methods. The new formula uses a very simple equation $p = \frac{Z}{F}(fP_h + cP_c)$, in which p is the percentage lethal heat necessary to sterilize, F is the number of minutes necessary to destroy organism at 250° F., f is the usual parameter representing the slope of the heating curve, c is the corresponding parameter representing the slope of the cooling curve, Z is antilog $(T_1 - 220)/z$, T_1 is the retort temperature, z is the slope of the thermal death-time curve, P_h and P_c are functions of g and z which have been tabulated, and g is the temperature difference between the critical point in the can and the heating medium at the end of the heating phase. The term fP_h is a measure of the lethal value of the heating phase and cP_c is the corresponding measure for the cooling phase.

Ball and Olson used graphical methods for determining the values of P_h and P_c quoted in their tables. An analytical expression can be obtained for P_h which permits greater accuracy of calculation than is generally feasible by graphical methods. This had been used in preparing a table that is entitled, "values of the function $10^{30/z}P_h$", which is presented in this article.

A problem in the practical use of the table of P_h of Ball and Olson is that P_h varies rapidly with z in a way that makes for difficulty in interpolating accurately along horizontal lines or between integral values of z in the table. The function $10^{30/z}P_h$ makes interpolation much more convenient; therefore, the recalculated values have been tabulated in this form.

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4.11 DETERMINATION OF POLYUNSATURATED ACIDS IN LIPIDES OF PLASMA AND TISSUE

Holman, Ralph T. and Hayes, Herbert (The Hormel Institute and Department of Physiological Chemistry, University of Minnesota, Austin)
Analytical Chemistry 30, 1422-1425 (August 1958)

In biological studies involving polyunsaturated acids, it often is necessary to determine the content of these substances in very small samples. Methods now in use require isolation and weighing of lipids prior to isomerization, and this requirement may complicate or preclude an adequate analysis. Some of the methods use conditions of isomerization far from optimum for the more highly unsaturated acids, and some are not standardized against pure acids or all of the types of polyene acids.

The authors developed a modification of alkaline isomerization based upon a systematic study of isomerization. Their modification uses highly purified polyunsaturated acids as standards.

Specifically, theirs is a micromethod for determination of polyunsaturated acids in 1 gram of tissue or a few milliliters of plasma. They determined the optimum conditions of isomerization upon pure polyunsaturated acids and established constants for the calculation of the various polyene types. Reproducibility of isomerization varied between 2 and 10 percent for the various polyenes. Nonacid polyenes were isomerized to determine possible interference by unsaponifiable matter containing polyunsaturated materials.

Absorption measurements are made at 375, 346, 315, 268, and 233 millimicrons. The differences $k = k_i - k_b$ (where $k_b = \frac{D}{g/L}$ and $k_i = \frac{D}{g/L}$ the extinction coefficients before and after isomerization, respectively, for the five wave lengths measured) are substituted in the following equations for the calculation of polyenoic acid contents expressed as percent of total lipide:

(over)

ABSTRACTER: F. Bruce Sanford

POUCHES FOR FROZEN FOODS

CANNING PROCESS CALCULATING

CL. BOTULINUM IN CURED FISH

POLYUNSATURATED ACID IN LIPIDES

3.337

4.11

% docosahexaenoic acid = $4.186k_{375} - 0.1778k_{346}$

% eicosapentaenoic acid = $1.559k_{346} - 1.628k_{375}$

% arachidonic acid = $1.456k_{315} - 1.344k_{346} - 0.4128k_{375}$

% linolenic acid = $1.266k_{268} - 0.8028k_{315} + 0.3172k_{346} - 1.778k_{375}$

% linoleic acid = $1.087k_{233} - 0.615k_{268} - 0.1354k_{315} - 0.1072k_{346} - 0.412k_{375}$

Table I gives extinction coefficients developed by pure polyunsaturated acids after isomerization, and table IV (omitted) gives extinction coefficients developed by nonacid polyenes.

Table I.--Extinction coefficients of pure acids after isomerization

Acid	375 mμ	346 mμ	315 mμ	268 mμ	233 mμ
Linoleic [a]	...	...	...	...	92.0
Linolenic[a]	...	...	...	79.0	44.7
Eicosatrienoic	...	...	...	87.0	56.7
Octadecatetraenoic	...	...	65.2	45.1	36.4
Eicosatetraenoic[a]	...	...	68.7	44.1	33.2
Eicosapentaenoic[a]	2.85	67.2	62.8	27.6	30.6
Docosahexaenoic[a]	25.0	26.1	31.2	48.6	43.3
Recommended slit width, mm.	0.2	0.2	0.3	0.5	1.0

[a] Constants from these acids were used for derivation of equations given in text.

3.2383

2. Oysters are a good product for this package, resulting in seafood "as it comes from the shell."

3.5 (Cross Reference: 0.5)

time. Negative cultures were observed for another 3 weeks. The most probable number of spores per ml. was read from an ordinary (MPN) table for B. coli.

Shortly after the last estimation of spores, each of the positive cultures was tested for toxin by intraperitoneal injection of 0.2 ml. of the clear upper part of the culture fluid into a mouse.

Results.--The high concentration of NaCl in the brines prevented germination of the Cl. botulinum spores during the experimental time. Nevertheless, it might be interesting to know something about the effect of NaCl on the different types. Experiments have been carried out with spores inoculated into peptic digest liver broth containing increasing concentrations of NaCl. Each tube was inoculated with about 500 spores. The results obtained from the experiments are summarized in table 2. A marked difference in the inhibitory action of NaCl on the types of Cl. botulinum was noticed. Type A tolerated at least 7-percent NaCl, germination of type B spores was prevented by a little more than 6-percent NaCl, and a concentration of about 4-percent NaCl had a definitely inhibitory action on the spores of type E. NaCl at the concentrations just mentioned delays the germination of spores.

The complete survival of the spores of different types of Cl. botulinum in the curing brines suggests that several other species of micro-organisms will behave in the same way. Under normal circumstances, pollution of the curing brine will take place, and for brines in continuous use, there will always be the possibility of an accumulation of harmful and dangerous organisms. These problems stress importance of careful examination of curing brines used in the preservation of foodstuffs.

Table 2.--The inhibitory effect of sodium chloride concentration on the germination of different types of Cl. botulinum spores in peptic digest liver broth

Type	Salt (g./100 ml. medium)		Time to visible growth (days)	Temp. (° C.)
	Growth	No growth		
A	7.3	7.4	16	37
B	6.3	6.4	26	37
E^1	3.9	4.1	17	30
E^2	3.9	4.1	17	30

*The negative cultures were observed during 30 days

2.1121 INSTRUMENT FOR ADJUSTING EQUAL LENGTHS OF WARP LINES OF TRAWLING GEAR

Bulmann, A.
Die Fischereiwelt 9, p. 57 (Sept. 1957) (Bremerhaven-F. W. Germany)
World Fisheries Abstracts 9, 19-20 (July-August 1958)

For fishing with trawling gear, warps should be of equal lengths, as otherwise the catch is adversely affected by the wrong position of the trawl. Moreover, the net may be damaged by the unequal pull. It is not sufficient to measure the warps as the lengths may change during fishing. In the opinion of the author, it is equally insufficient to measure the tensile strength. The new method, patent for which has been applied for (DP 1000630), provides that a line attached to the 2 wings is to be put on the trawl. The central spot of this line is marked. A float is fastened to the line by a clip in such a way that it may freely move to and fro. If the net is in the right position, the float will be towed exactly in the middle of the additional line at the marked spot. If the net is in a wrong position, the float will be more or less away from the central spot during towing. The clip fastening the float to the line is kept open by a piece of rock salt. This dissolves during towing and the clip fixes the float to the rope. Thus it can be seen later on, whether the warps had been of equal lengths. In this case the float must be clipped to the central spot exactly. If it is not, it will more or less be displaced. The unequal lengths of the warps can be adjusted during the next fishing operation.

ABSTRACTER: A. von Brandt

4.11 ANALYTICAL SEPARATION OF THE METHYL ESTERS OF THE C_8-C_{34} STRAIGHT-CHAIN FATTY ACIDS AND THE DETECTION OF ODD-CARBON-NUMBER ACIDS IN COMMERCIAL MIXTURES OF FATTY ACIDS BY GAS CHROMATOGRAPHY

Khan, M. A. and Whitman, B. T.
Journal of Applied Chemistry 8, 549-552 (September 1958)

By means of equipment commonly used in gas chromatography and a high temperature katharometer, which is capable of operating at temperatures up to 300°, the authors have been able to analyze mixtures containing saturated and unsaturated fatty acid esters from C_6 to C_{18}. Furthermore, this technique may be applied to the separation of methyl esters up to C_{34}. By the use of low column pressures it has been possible to detect in fatty acid mixtures the presence of small amounts of odd-carbon-number fatty acids. Experiments in the gas chromatography of hydrogenated fish oil provide confirmation of the existance of C_{15}, C_{17}, C_{19}, and C_{21} acids, which were found to be present to the extent of 0.3, 0.7, 0.7, and 0.8 percent, respectively.

Initially, a study was made of the influence of various factors (column temperature, column pressure, column length, and flow rate) on the resolution of known mixtures of fatty acids (table 1, see over). Quantitative determination of the various components of a mixture was carried out by the peak-area-distribution technique (table 2, omitted). Data also was presented to illustrate the resolution of (1) a mixture of higher fatty acids and (2) a mixture of methyl esters from commercial fatty acids.

For members of an homologous series it has been established that the following straight line relationship is valid:

$$\log V_R^\circ = a + bn$$

(over)

ABSTRACTER: Donald C. Malins

4.11 CHOLESTERYL ESTERS OF LONG-CHAIN FATTY ACIDS INFRARED SPECTRA AND SEPARATION BY PAPER CHROMATOGRAPHY

Labarrere, J. A.; Chipault, J. R.; and Lundberg, W. O.
Analytical Chemistry 30, 1466-1470 (September 1958)

Pure cholesteryl esters of fatty acids were prepared for use in the development of analytical procedures for the separation and identification of these compounds. Cholesteryl laurate, myristate, palmitate, stearate, oleate, linoleate, and linolenate were prepared in pure form for this purpose.

Ascending, reverse-phase paper chromatography, using the systems acetone-ethanol, formic acid-water, and chloroform-methanol-formic acid-water, consecutively on the same paper, served to separate mixtures of saturated and unsaturated cholesteryl esters. Table II (omitted) presents the R_f values of cholesterol and cholesteryl esters in these solvent systems.

The infrared spectroscopy showed that it is possible to differentiate between saturated and unsaturated cholesteryl esters and, furthermore, to determine the nature of the fatty acid on the cholesterol molecule by examination of the infrared spectra.

Solution and solid state spectra of cholesterol and its esters show bands at 11.90 and 12.50 microns caused by the C-H linkage adjacent to the 5,6 double bond of the cholesterol molecule. There is also a very weak band at 6.0 microns caused by the stretching vibration of the double bond. Strong absorption peaks at 3.4, 6.8, and 7.3 microns are caused by C-H bonds of methylene and methyl groups of cholesterol and fatty acid radicals. Cholesterol shows a peak at 2.78 and 3.0 microns due to O-H stretching vibrations of free and bonded hydroxyl groups. The strong peak of cholesterol at 9.5 microns has been assigned to the C-O vibrations of the hydroxyl group by previous authors.

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ABSTRACTER: Donald C. Malins

4.11 MICRODETERMINATION OF THE FATTY ACIDS IN BLOOD SERUM

Pikaar, N. A. and Nijhof, J. (State University of Utrecht, The Netherlands)
The Biochemical Journal 70, 52-57 (September 1958)

Introduction.--In the present paper the techniques of Herb and Riemenschneider (1953); Evans, Waldron, Oleksyshyn, and Riemenschneider (1956); and O'Connell, Lipscomb, and Daubert (1952) have been modified to make duplicate determinations of fatty acids in 2 milliliters (ml.) of serum. The method of van de Kamer, Pikaar, Bolssens-Frankena, Couvee-Ploeg, and van Ginkel (1955) for the determination of higher saturated fatty acids also was modified to permit assays based on only 4 ml. of serum. This method depends on reverse-phase chromatography on a rubber column (Boldingh 1953). Determination of the total fatty acid content easily can be included to allow for the calculation of the total unsaturated fatty acid content. If the amount of total unsaturated and total polyethenoid fatty acids is known, the monoethenoid fatty acids can be calculated by subtraction.

Special reagents.--To prepare 21-percent weignt by weight (w/w) potassium hydroxide in ethylene glycol, heat ethylene glycol to 190° C., cool to room temperature, add potassium hydroxide, flush with nitrogen, heat again to 190° C., cool, and store under nitrogen at -20° C. To prepare absolute methanol, treat methanol with aluminum amalgam. To prepare purified nitrogen, wash the purest cylinder nitrogen twice with 0.1 molar vanadyl sulphate, twice with 20-percent sodium hydroxide, and twice with water. To prepare purified rubber for chromatography, percolate the rubber in a column 90 cm. by 4 cm. with 3 liters of a mixture of acetone and 25-percent w/w hydrochloric acid (9:1) for 9 hours. To prepare thymol blue solution, dissolve 0.1-percent thymol blue in 96-percent unneutralized ethanol.

Methods.--Methods are presented in detail for the preparation of an extract of fatty acids from

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ABSTRACT: Martin Heerdt

INSTRUMENT FOR ADJUSTING WARP LINES

CHOLESTERYL ESTERS OF FATTY ACIDS

FATTY ACID SEPARATION

MICROASSAY FOR FATTY ACIDS

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The cholesteryl esters do not show the hydroxyl group absorptions near 3.0 and at 9.5 microns. A strong, sharp band at 5.78 microns due to the ester carbonyl group is present, however. The peaks at 8.0 and 8.5 microns are normally considered to be a function of C-O vibrations of the ester linkage. Bands at 10.5, 11.9, and 12.5 microns are found in the spectrum of cholesterol and its esters. In the latter, however, the bands are present in diminished intensity.

The spectra of cholesteryl stearate, palmitate, myristate, and laurate falls between 7.5 and 8.5 microns. These spectra demonstrate the relationship between the number of bands and the length of the fatty acid chain. It is proposed that one band exists for each methylene group of the chain, but incomplete resolution allows the detection of only half of these bands in the long chain derivatives,

The unsaturated esters may be distinguished from the saturated derivatives by the presence of a small peak at 8.8 microns, and the unsaturated compounds may be differentiated from each other by the weak bands in the vicinity of 9.0 microns.

The near infrared spectrum of cholesterol shows a strong, fundamental O-H stretching vibration at 2.77 microns, a weaker first overtone at 1.41 microns, and a weak triplet at 2.00, 2.05, and 2.07 microns. The O-H absorption is absent with esters. The near infrared region shows no structure that may be characteristic of cholesterol or its fatty acid esters.

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serum, for the determination of polyethenoid fatty acids by isomerization, for the calculation of the polyethenoid fatty acids, for the determination of the effect of saponification on the polyethenoid fatty acids, and for the determination of total and saturated fatty acids.

Results.--The new method has been tested by carrying out comparative determinations both with the macro and the micro method of Herb and Riemenschneider (1952, 1953). For this purpose a sample of cod-liver oil was used because this oil contains polyethenoid fatty acids with two to six double bonds. The results of the determinations based on cod-liver oil are tabulated. As fish oils are known to contain polyethenoid fatty acids to which the normal calculation cannot be applied (Herb and Riemenschneider, 1953), the results are given in optical densities only. The modified method and the micro method of Herb and Riemenschneider agree closely, whereas the macro method shows somewhat higher optical densities at 233 and 268 mμ and lower optical densities at 346 and 374 mμ.

To test the accuracy of the new method, two samples of pooled sera (A and B) collected from several hundred patients each were analyzed 12 times. The results, including the calculated values for the monoethenoid fatty acids, the found and calculated iodine values, and the calculated mean molecular weights of the fatty acids are tabulated.

The standard deviations are identical for both sera and do not vary for small and large quantites. The calculated iodine value for pooled serum B is in good agreement with the experimentally determined value. The calculated mean molecular weight of the fatty acids corresponds to the values reported in the literature; that is, 277.2 according to Smith and Kik (1933), 281 according to Wilson and Hansen (1935), and 277 according to Page and Michaud (1951). Values presented for ten fasted, normal males show that the mean composition is identical with that of two samples of pooled sera.

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where V_R° is the retention volume, n is the number of carbon atoms in the corresponding fatty acid molecule, and a and b are constants depending on the temperature, pressure, and flow rate.

Table I. Retention volumes of the methyl esters of C_{18}-C_{34} saturated fatty acids at 295° relative to methyl stearate, the retention volume of which at the same temperature is 69.3 c.c./g.

Carbon no. of the acid	Relative retention volume
C_{18}	1.00
C_{20}	1.63
C_{22}	2.48
C_{24}	3.63
C_{26}	5.63
C_{28}	8.56
C_{30}	13.15
C_{32}	21.15
C_{34}	30.11

4.14 THE LIPIDE-BOUND VOLATILE ACIDS OF ANIMAL FATS

Herting, David C.; Ames, Stanley R.; and Harris, Philip L. (Eastman Kodak Company, Rochester, New York)
Archives of Biochemistry and Biophysics 74, 92-99 (March 1958)

Introduction. --The consideration for food use of distilled acetylated monoglycerides, in which both short- and long-chain acids are present in the same molecule, has reopened the question of deposition in body fats. Although the distilled acetylated monoglycerides are split extensively in the gastrointestinal tract, it is possible that acetylated glycerides might appear in the blood stream and subsequently be deposited in body fats. This applies, in particular, if there is absorption of any undigested molecules or of intermediate lipolytic products, which are then re-esterified.

Sources of samples. --Control rats were fed either a stock diet containing hydrogenated vegetable shortening or a purified diet containing lard or fully hydrogenated lard. Experimental rats were fed purified diets containing from 15 to 50 percent of distilled acetylated monoglycerides for at least 8 weeks and as long as 63 weeks. Dogs were fed either a standard dog chow or a ration containing 75 percent of the chow and 25 percent of a 50:50 mixture of distilled, fully acetylated monoglycerides made from lard and distilled, partially acetylated monoglycerides made from hydrogenated lard.

Extraction of fat from tissues. --Liver, kidney, lung, and skin fats were extracted from the homogenized tissue with petroleum ether-ethanol. Fat depot materials (mesenteric, perirenal, and subcutaneous) were ground with granular anhydrous Na_2SO_4 and extracted three times with ethanol and three times with ethyl ether, using 100 ml. of solvent each time. Blood lipides were measured according to the method of Fillerup and Meat (1953), except that whole blood was used, and the centrifuged cells were re-extracted.

Saponification of fat. -- A homogeneous sample of fat weighing 0.75 to 1.00 grams, if available,
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 ABSTRACTER: Martin Heerdt

4.29 METHYL ESTERS FROM MARINE OILS

Vandenheuvel, F. A. and Jangaard, P. M. (Fishery Technological Station, Halifax, Nova Scotia)
Canadian Chemical Processing, pp. 40-42, 44, 46 (March 1957)

Marine oils are unique among fats of natural origin as potential raw material for the manufacture of a wide variety of compounds. The complexity of these oils is illustrated in Figure 1 (omitted), which shows the fatty acid composition of a typical sample of herring oil. The relative amount of each acid is indicated by the size of the black rectangular area; the sum of all areas is 100 percent. All of the members of the even carbon series from C_{10} to C_{24} are present, with unsaturation ranging from zero to six double bonds. The double bonds are distributed among the glycerides in a random fashion.

Physical methods of separation result in glyceride fractions that do not reflect the different properties inherent in the component acids. For this reason, a preliminary breakdown of the triglycerides is necessary for efficient fractionation. Fractionation may be accomplished by (1) fat hydrolysis, which yields acids, and (2) alcoholysis, which yields alkyl esters. In this paper, the authors attempt to demonstrate that alcoholysis is the superior method of fractionation because it is economical and because the esters that are produced are better compounds for further processing than are acids.

Earlier research. -- Wright and coworkers have demonstrated that the production of alkyl esters from alcohols of low molecular weight is superior to hydrolytic methods of fat-splitting. The alkyl ester method of fat-splitting results in a good yield of glycerol and requires a small plant and less labor for an equivalent production of fat components than do hydrolytic methods. Experimental studies by the authors confirmed these findings and showed an even higher yield of glycerol.

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 ABSTRACTER: Kathryn L. Osterhaug

4.15 THE DISTRIBUTION OF UNSATURATED FATTY ACIDS IN LIVER LIPIDS

Okey, Ruth and Harris, Anne Grace (University of California, Berkeley)
Archives of Biochemistry and Biophysics 75, 536-537 (June 1958)

Introduction. --Linoleic and arachidonic acids are both rated as essential fatty acids. Linoleic is found chiefly in plants. It accumulates in animal tissue only if fed in considerable quantities. Dietary linoleic acid is, however, rated as essential to synthesis of arachidonic acid by animal tissue.

Experimental. -- During an investigation of the effect of the composition of dietary fat on the fatty acid moieties of liver lipids, fractionation of fresh liver lipid extracts was carried out by chromatography on silicic acid columns. Cholesterol esters were saponified, and cholesterol was removed with digitonin. Ester fatty acids were conjugated with 11 percent KOH in ethylene glycol, and the percentage of di- and polyenoic acids was estimated. Iodine numbers were determined, and the presence of very considerable proportions of oleic acid in the cholesterol ester was confirmed by reverse phase chromatography on silicone-coated paper, using 80:20 glacial acetic acid and water. The glyceride and the combined phospholipid fractions from the silicic acid column were similarly investigated. Data for 6 male and 6 female rats which had been fed a synthetic diet containing 10 percent cottonseed oil and 1 percent cholesterol for 7 weeks are shown in Table 1 (see over). The cottonseed oil had an iodine number of 104 and contained approximately 55 percent linoleic acid.

Discussion. --It is recognized that data secured by this procedure represent semi-quantitative rather than absolutely accurate percentages of the fatty acid fractions concerned. Nevertheless, the methods used were strictly comparable and the differences seem sufficiently clean cut to indicate that a large proportion of the arachidonic acid in liver is to be found in the phospholipid. Cholesterol ester and glyceride, on the other hand, contained little arachidonic but considerable amounts of

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 Reprinted in whole

4.64 PHENOLIC ANTIOXIDANTS AND THE STABILITY OF PERIRENAL RAT FAT

Johnson, A. R.; O'Halloran, M. W.; and Hewgill, F. R. (University of Adelaide, South Australia)
Journal of the American Oil Chemists' Society 35, 496-501 (October 1958)

Purpose. -- Experiments described in this paper were designed to assess the effect of ingested BHA and BHT upon the stability of extracted perirenal rat fat.

Experimental. -- A stock diet was fed. This diet consisted of rolled oats, 300 grams (g); crushed wheat, 300 g.; B mixture, 300 g.; cooked beef mince, 80 g.; water, 200 milliliters (ml.); milk, 80 ml.; and a commercial vitamin concentrate containing not less than 16,000 I.U. vitamin A and 2,000 I.U. vitamin D per ml., 0.5 ml. The B mixture contained pollard (shorts), 10 parts; wheat germ, 10 parts; lactic casein, 7 parts; full-cream powdered milk, 6 parts; sodium chloride, 1.25 parts; and calcium carbonate, 0.5 parts. The stock diet was supplemented with freshly rendered lard to the extent of either 100 or 200 g. per 900 g. of the dry materials in the diet. The total fat content of the supplemented diets was 16.6 or 24.5 percent, respectively, on a dry weight basis as calculated from standard tables.

The freshly rendered lard, which was guaranteed free of added antioxidants, was purchased at three-month intervals and stored under nitrogen in sealed containers at -15° C. until required. Sufficient lard was removed from the nitrogen storage at weekly intervals for one week's diets. Antioxidants were added to the lard, and the control and experimental lards were dispensed and stored at 0° C. Melted dispensed lard, after homogenization with the liquid components of the diet and the cooked meat, was manually mixed with the remainder of the diet. The supplemented diet was prepared and fed daily except for the week-end and holiday periods when double quantities were

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 ABSTRACTER: Martin Heerdt

VOLATILE ACIDS OF ANIMAL FATS

LIVER UNSATURATED FATTY ACIDS

MARINE OIL METHYL ESTERS

ANTIOXIDANTS IN DIET OF RATS

4.15

linoleic and oleic acids. Rats fed a series of fats poor in linoleic acid provided the following information.

If the proportion of arachidonic acid in liver phospholipid tends to remain high, the amount of linoleic acid in liver cholesterol ester, glyceride, and phospholipid is dependent on the amount of these components in the diet.

Table I.--Unsaturated fatty acids as percentage of total fatty acid moiety in liver lipids[a]

Type of acid	Cholesterol ester	Glyceride	Phospholipid
Dienoic	34.0 ± 1.6[b]	49.0 ± 2.1[b]	15.50 ± 0.88[b]
Trienoic	0.75± 0.18	1.5 ± 0.48	0.16 ± 0.11
Tetraenoic	2.90± 0.31	3.6 ± 0.36	27.0 ± 1.2
(Pentaenoic)	0.0 ± 0.0	0.75± 0.57	3.2 ± 0.38
(Hexaenoic)	0.58± 0.19	0.0 ± 0.0	2.2 ± 0.65

Note: The percentage of total cholesterol in the livers was 3.04 ± 0.43 for females, 4.48 ± 0.32 for males. [a] Six female and six male rats. [b] Standard error.

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prepared and fed every second day. The animals were supplied with food and water ad libitum.

Results summarized.--Ingested BHA and BHT, in amounts of 100 and 500 times the normal level of usage in fats for human consumption, increased the stability of extracted perirenal rat fat. BHA at the normal level of usage provided an increase in stability that was not quite significant. Preheating of unstabilized lard and lard stabilized with BHA caused a 31-percent reduction in the stability of both male and female perirenal rat fat. This reduction in the stability of lard stabilized with 1.0 and 5.0 percent BHA cannot be ascribed to heat destruction.

Irrespective of the presence or absence of BHA, fat from female rats was 87 percent more stable than fat from male rats that received both heated and unheated lard with the same level of BHA. The presence of a constant level of BHT in the diet and varying amounts of lard did not influence the increase in stability afforded by the incorporation of BHT in the diet. Supplementation of the diet with 10 percent of a 1-percent solution of BHT in coconut oil increased the stability of perirenal fat from male and female rats.

The iodine value of rat fat was decreased by feeding the rats a diet supplemented with 10 percent unheated lard containing 0.01 percent BHA and increased by feeding the rats a diet supplemented with 10 percent heated lard containing 0.5 percent BHA. Reductions in iodine value resulted in the fat of rats that received diets containing 0.1 percent and 0.5 percent BHT.

Attempts to isolate the stabilizing principles proved only partially successful. Materials possessing antioxidant activity and giving the usual color reactions for the appropriate antioxidant were isolated in amounts insufficient for characterization. Possible mechanisms to explain the observed differences are discussed.

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was saponified in 50 milliliters (ml.) of aqueous 5.0 normal Na_2CO_3 under reflux for 4 to 5 hours.

Steam distillation of volatile fatty acids.--Volatile acids were distilled at reduced pressure after the method of Herting, Embree, and Harris (1956) with several modifications. Since the addition of $AgNO_3$ was unnecessary in the absence of chloride, H_2SO_4 could be used for acidification of the saponification mixture to about pH 4. To determine the amount of steam-distillable, water-insoluble fatty acids, the chilled distillate was filtered prior to titration. The condenser and filter paper were washed with ethanol made just pink with dilute NaOH and phenolphthalein, and the ethanol solution was titrated with standard NaOH.

Paper chromatography of volatile fatty acids.--The titrated distillates were dried, and the sodium salts were converted to the corresponding hydroxamate derivatives via the methyl esters. Separation of C_1 to C_4 acids was accomplished on Whatman No. 1 paper, using the alcohol phase of a mixture of normal-amyl alcohol, formic acid, and water. Formic and lactic acid hydroxamates were resolved on Whatman No. 54 paper, using ethanol-pyridine-water-NH_4OH. The C_5 to C_{12} acids were separated on a 75 percent cellulose acetate-25 percent cellulose paper (No. 0-476, H Reeve Angel and Co., Inc.), using ethyl acetate-tetrahydrofuran-water. Ascending chromatography at 22° C. after prior equilibration was used in all separations.

Results.--Identification of volatile acids recovered from saponified fats by steam distillation was accomplished by paper chromatography of their hydroxamate derivatives. Analyses of various tissue fats from the rat, dog, and guinea pig and analyses of human blood lipides showed small amounts of lipide-bound volatile acids in each sample. Feeding distilled, acetylated monoglycerides to rats at dietary levels up to 50 percent increased the lipide-bound, steam-distillable acids in blood but not in tissue fats or carcass fat. The low levels of these acids that were found in tissue fats from a dog fed a standard dog meal were not elevated by feeding a diet containing 25 percent distilled, acetylated monoglycerides.

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It also has been found possible to replace acids by esters in all reactions involving polyols. Methyl esters, with the proper catalysts, were found (1) to be more reactive than were the corresponding acids and (2) to yield products lighter in color and of better quality than are those of the acids. Methyl ester constitute a superior raw material for the production of monoglycerides, alkyds, drying or non-drying polyesters, and varnishes. The esters also may be reduced to alcohols by the well established sodium process.

The object of the work reported here was to find an efficient and economical method of ester fractionation.

The method finally selected for the separation of the products formed from methanolysis was counter-current solvent segregation followed by fractional distillation. Nitromethane was chosen as the solvent in the former process because it is efficient at room temperature and at a low solvent-to-ester ratio.

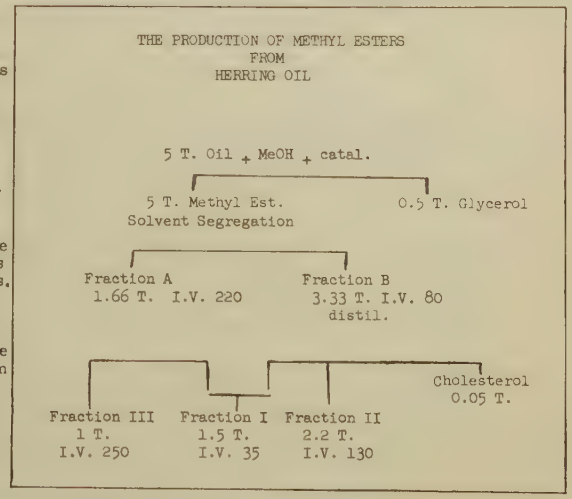

Figure 3 is a chart describing the products obtained from 5 tons of herring oil by methanolysis and solvent segregation.

3.4 A NEW METHOD FOR THE PRODUCTION OF SMOKE

Olsen, H.
Konserves 15, p. 61 (June 1957) (In Danish)
World Fisheries Abstracts 9, 39-40 (July-August 1958)

Describes the 'H. O. smoke generator' developed for the smoking of fish and other foods. The fig. (omitted) shows the upper part of a vertical section of the generator. A large wheel rotates slowly in a somewhat larger circular chamber, the interspace being divided up into sections by radial elongations on the wheel surface. Firewood is fed through a funnel on top of the generator into the adjoining section. At the beginning of its rotation the firewood is lit by an electrical ignition spiral. Through another funnel (left side of fig.), preheated air enters the smoke chamber, passes through the upper glowing wood layers and radially through the lower, cooler wood layers, then through openings in the wheel surface into the central space, from where it is led to the smokehouse.

When each section in its turn comes into the lowest position ashes and charcoal empty into a collecting container underneath.

The system works nonstop and automatically. The smoke is free of dust particles due to the filtration effect when it moves through the cooler wood below the glowing layers. A similar effect to that of ordinary pipe smoking is thus obtained.

One of the main purposes of this new apparatus is to divide the production of smoke and hot air into 2 separate and independent procedures. This makes it possible to adjust the temperature and humidity of the smoke/air mixture in the smokehouse to the optimal conditions of the product being smoked.

 ABSTRACTER: Poul Hansen

5.120 UTILIZATION OF VITAMIN A IN DIFFERENT CARRIERS BY BEEF CATTLE

Sherman, W. C.; Kuhn, G. O.; While, E. A.; Lewis, W. D.; Reynolds, W. M.; and Luther, H. G. (Chas. Pfizer and Co., Inc., Terre Haute, Indiana)
Journal of Animal Science 17, 586-592 (August 1958)

The efficiency with which various species of animals utilize vitamin A is influenced by the nature of the carrier. Humans, for instance, have been found to utilize aqueous solutions of vitamin A better than they utilize vitamin A in oil solution. Aqueous forms of vitamin A also have been shown to be superior to oil forms when fed to dairy calves, to chicks, and to rats. Vitamin A dispersed in gelatin beadlets has been found superior to vitamin A in oil solution for liver storage in rats and for growth and liver storage in chicks.

The investigation reported in this paper compares the effectiveness for beef cattle of vitamin A (1) in oil solution, (2) in aqueous emulsion, and (3) in gelatin beadlets.

Values for plasma vitamin A were obtained in eight experiments that used a variety of dosages of vitamin A. The lowest dosage level (2800 I. U. per 100 pounds of body weight) resulted in no appreciable rise in plasma vitamin A in animals given the oil solution, but an appreciable rise did occur in those animals given the vitamin in aqueous solution and in gelatin beadlets. With a single dose of 5600 I. U. per 100 pounds of body weight, the response to the aqueous dispersion was not only more rapid than the response to the oil solution but also significantly greater.

A comparison of vitamin A palmitate in oil and in gelatin beadlets, each at 6000 I. U. per 100 pounds of body weight, showed the response to the vitamin A in gelatin to be both faster and higher than the response to the oil solution of vitamin A.

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 ABSTRACTER: Kathryn L. Osterhaug

4.92 AUTOXIDISED AND HEATED FATS AS A NUTRITIONAL HAZARD - 2

Newman, A. A.
Food Manufacture 33, 422-425 (October 1958)

Hydroperoxides.--Linoleic ac-hydroperoxide was the most toxic of a number of individual hydroperoxides included in a study of these compounds. Fatty hydroperoxides are readily absorbed, and they can be detected shortly after ingestion in such disparate parts of the body as the liver or the adipose tissue of the muscles. Fatty hydroperoxides will attack vitamins, inhibit certain enzymes, affect the mitochondria, interfere with the function of cortisone, reduce the viscosity of DNA, attack haemoglobins, destroy vital -SH linkages; and they may exert mutagenic action. An important consequence of the action of hydroperoxides on unsaturated glyceride components is the depletion by the body of its reserves of essential fatty acids. A less specific consequence from the consumption of peroxidized fats is the need for a higher caloric intake, particularly in the form of proteins.

Thermally polymerized fats.--Heat polymerized fats appear to be more toxic, owing to their cyclic nature, than do hydroperoxides, which are produced in the absence of oxygen. The relevant literature shows that cyclic dimers can be absorbed by the animal body and that they are capable of behaving as active toxic agents. The fact that fractions consisting of dimeric esters of heated oils were found to be lethal is indicative of the possible damage that can result from the consumption of these fats. Cyclic monomers formed within thermally polymerized fats were sufficiently toxic to exert a noticeable growth-depressing effect even when present at the low level of 2.5 percent in the diet.

Straight-chain compounds.--Included in this groups are: hydroxylated and epoxylated compounds, conjugated fatty acids, and lactones. In moderately heated oils, the concentration of such compounds

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 ABSTRACTER: Martin Heerdt

6.193 THOSE MYSTERIOUS UNIDENTIFIED GROWTH FACTORS

Rasmussen, R. A. (Peter Hand Foundation)
Western Feed and Seed 13, 19, 47 (September 1958)

The need for unidentified growth factors has been reported in accounts of animal-nutrition studies with all farm animals and with most pet and fur stock. Since the greatest advances in unidentified-factor nutrition have resulted from nutritional studies with poultry, this discussion is concerned chiefly with the results of studies on poultry nutrition.

Recognition of unidentified factors.--Unidentified growth factors are known only through the production of an extra animal-growth response from feeding crude materials (carriers). If the carrier-fed group gains weight significantly faster than does the control group, then the carrier is postulated to contain an unidentified growth factor. If two different carriers of an unidentified factor that are fed together produce a response greater than does either carrier fed alone, two unidentified growth factors are postulated. If the ash secured from burning a carrier of an unidentified growth factor also produces an extra growth response, then the unidentified factor is considered to be mineral (inorganic).

Inorganic factors.--Studies on unidentified factors have revealed two new nutritionally important minerals, molybdenum and selenium, and have shown that known mineral nutrients, zinc and potassium, can be limiting factors in practical rations. As a result of these findings, many poultry and swine rations are fortified with from 25 to 100 p. p. m. of added zinc, some poultry rations are fortified with $\frac{1}{4}$ gram of sodium molybdate per ton, and potassium requirements are being reevaluated.

Organic factors.-- The testing of many different materials as carriers of unidentified factors

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 ABSTRACTER: June H. Olden

4.92

is not sufficient to become dangerous, but their potential toxicity should not be minimized. Conjugated compounds may inhibit arachidonic synthesis, whereas certain lactones are known to have cytotoxic properties. As with the fatty acids, the oxidation and thermal decomposition products of cholesterol can be harmful. Ingestion of cholesterol or cholesterol-derivatives heated to 300° C. or over can lead to serious pathological consequences, including the formation of lung abcesses and spindle or giant cell sarcomas.

Other factors affecting toxicity. -- The length of the heating period, the level of the temperature applied, and the amount of heated fat consumed all are vital factors. The presence of certain catalysts also may profoundly influence both the proportion of the denaturation products and their relative toxicities. A sample of cottonseed oil heated to 325° C. in the presence of iron became almost entirely unsaponifiable after a heating period of only 2½ hours. These findings are of practical importance, since many sauce pans and frying pans are made of iron.

Toxicity also is influenced by the degree of unsaturation of the fatty acids involved. If lard and cottonseed oil are heated under identical conditions, the cottonseed oil will yield on distillation a residue that is more toxic than that from lard. A high proportion of proteins may counteract the harmful effects of many peroxidized fats. Fresh fat also will offset the toxicity of the heat-damaged portion. The degree of protection afforded by these means will be less complete with some fats than with others.

Domestic cooking. --During the frying of meats, fish, and other foodstuffs, temperatures from 250° to 300° C. may be reached. At these temperatures, the formation of toxic substances in fats reaches a critical level. Kaunitz et al. found that 9 female mice, out of 24, painted with a solution of "browned" butter, fats extracted from fried meats, or roast coffee developed malignant tumors. The cancerous nature of these tumors is open to some doubt, but the findings appear to indicate that comparatively humdrum foods can cause pathological lesions of a serious nature.

6.193

has resulted in the postulating of four factors: (1) the fish factor, (2) the fermentation-solubles factor, (3) the grass-juice factor, and (4) the protein factor. The need for fish factor, fermentation-solubles factor, and grass-juice factor has been demonstrated in both experimental and practical rations. The protein factor is evident only when amino acids are used to replace protein.

Sources of organic factors. -- Most sources of unidentified factors predominate in one factor and carry lesser amounts of one or more of the other factors. Sources of the various organic factors are as follows: (1) fish factor: fish solubles, fish meal, meat scraps, poultry byproduct meal, and penicillin mycellium meal; (2) fermentation-solubles factor: grain distillers dried solubles, liver meal, dried brewers yeast, and soybean meal; (3) grass-juice factor: dehydrated alfalfa meal, fresh forage juice, dried whey, dried skim milk, dried buttermilk, soybean meal, and liver meal; and (4) protein factor: gelatin, casein, soybean meal, and peanut meal.

The fish-factor content of carriers is variable, and fish meals vary as much as four times in fish-factor values. The amount of fermentation-solubles factor appears to vary between different carriers of this factor. The same is true for the grass-juice factor.

Progress on identification of organic factors. -- Much work has been done toward the fractionation of carriers of unidentified factors. Potent fractions of fish factor and fermentation-solubles factor have been prepared, but methods have not yet been devised to remove these factors from their concentrates. Progress is slow because a rapid chemical or microbial method has not been discovered that will permit a worker to readily follow the isolation progress. Unless a rapid test is found, considerable time undoubtedly will elapse before the organic unidentified factors are identified.

3.4

5.120

With doses of 36,000 I. U. per 100 pounds of body weight given daily for 5 successive days, the gelatin beadlet form of vitamin A caused a faster response, as measured by the vitamin A level of the blood plasma, and maintained this lead for a period of 84 hours.

With a single dose of 72,000 I. U. per 100 pounds, the response was faster and greater for the animals given the vitamin A in gelatin, and the higher level was maintained for a period of 24 hours.

A direct comparison of synthetic vitamin A palmitate in gelatin and natural vitamin A in haliver oil, each form being given in a single dose of 36,000 I. U. per 100 pounds, showed that the synthetic product in gelatin gave a significantly greater response than did the natural product in fish-liver oil.

Solutions of natural vitamin A and of synthetic vitamin A were compared to determine if the differences in the isomeric forms of the two substances could partially account for differences in response. The results of this comparison, with cattle used as the test animals, showed no significant difference in the responses to the oil solutions of the synthetic vitamin A and the natural vitamin A.

6.190 AMINO ACID COMPOSITION OF THE PROTEIN AND INORGANIC CONSTITUENTS OF THE ASH OF POLLOCK FISH SCALES

Snyder, Donald G. (U. S. Bureau of Commercial Fisheries, College Park, Maryland)
Commercial Fisheries Review 20, 4-9 (August 1958)

The amino acid composition of the protein of pollock fish scales was determined by paper partition chromatography and microbiological analysis. The data indicate that the protein of pollock fish scales is probably a scleroprotein of the collagen type containing high levels of glycine and amounts of arginine and serine about equal to that found in the protein of whole egg. The scale protein contains fair amounts of alanine, proline, and hydroxyproline, and extremely small amounts of cystine and tryptophan. Also, the scale protein contains slightly less aspartic acid, glutamic acid, and threonine, and much smaller amounts of histidine, isoleucine, leucine, lysine, methionine, phenylalanine, tyrosine, and valine than does whole-egg protein. The inorganic constituents of the ash of pollock scales were determined semiquantitatively by spectrographic analysis. The data indicate that no unusual kinds or quantities of inorganic constituents that might cause biological injury when fed to animals are present in the ash of the scales. An interpretation of these findings is made in relation to conclusions obtained from a previously reported rat-feeding study on the comparative nutritive value, digestibility, and "biological value" of pollock-fish-scale and casein-lactalbumin proteins.

ABSTRACTER: Donald G. Snyder

7.89 A COLORIMETRIC METHOD FOR DETERMINING LOW CONCENTRATIONS OF MERCAPTANS

Ellman, George L. (Biochemical Research Laboratory, The Dow Chemical Company, Midland, Michigan)
Archives of Biochemistry and Biophysics 74, 443-450 (April 1958)

Introduction. -- The authors used a colorimetric method for the determination of mercaptans in low concentrations. This involved the liberation by bis(p-nitrophenyl) disulfide (PNPD) of one mole of p-nitrobenzenethiol for each mole of mercaptan used. The yellow nitrobenzenethiol anion is 99 percent ionized at pH 8 and has an extinction coefficient of 13,600/centimeters at 412 millimicrons (mμ) wave length. The mixed disulfides do not absorb at this wave length. Thus, the absorption at 412 mμ is a direct measure of the nitrobenzenethiol anion concentration.

Procedure. -- The absorbance (A) of a mixture consisting of 4 milliliters (ml.) of the neutral unknown solution, 1.0 ml. of a pH 8 phosphate buffer, 4.0 ml. acetone, and 1 ml. PNPD is read at 412 mμ. The concentration of mercaptan, C, in the final solution is given by the formula $C = \frac{A}{13,600}$ moles/liter.

Results. --For the compounds studied (cysteine, 2-mercaptoethanol, and 2-aminoethanethiol), quantitative recoveries were obtained within the error of the absorption measurements. Variations increase with decreasing concentration, the lower limit being about 1 microgram (μg.) cysteine in 4 ml. solution. The reaction is very specific for compounds containing a sulfur atom capable of existing as an anion at pH 8.0. No color was observed with pure samples of amides, amines, alcohols, ketones, aldehydes, disulfides, sulfides, diazonium salts, amino acids, or esters at concentrations of 0.1 to 0.5 mole, none of which interfered with the reaction. The heavy metal ions

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ABSTRACTER: Claude E. Thurston

7.80 FLAVOR TESTING TECHNIQUES FOR THE FROZEN FOOD PACKER

Salter, Lois A. (Department of Food and Dairy Technology, Oregon State College, Corvallis)
Frosted Food Field 26, 19-21 (June 1958)

The flavor and the appearance of food are the two quality factors most important to the consumer. Although many reliable objective measurements are available to aid in quality control, only subjective evaluation is satisfactory for judging flavor.

Flavor may be defined as the overall sensation perceived in the mouth when a food or beverage is consumed. Flavor consists of a complex of stimulations, the three main components of which are aroma, taste, and texture.

The three main types of flavor tests are (1) difference, (2) preference, and (3) consumer-acceptance tests. Of the three, only difference and preference tests can be conducted in the laboratory. Consumer-acceptance tests cannot be conducted in the laboratory because factors other than flavor are involved in initial acceptance of a food product.

In conducting laboratory flavor tests, the first factor to consider is the samples to be judged. Are the samples truly representative? The validity of the results is limited by the degree to which the samples represent the lot of product being tested.

Controlled and uniform preparation and serving of samples are essential. Samples to be judged at the same time should be in identical containers, of equal quantity, and at the same temperature. The serving temperature should be that at which the product is normally consumed.

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ABSTRACTER: Kathryn L. Osterhaug

8.42 AVAILABILITY OF CALCIUM IN BAGOONG ALAMANG, DRIED ALAMANG, CANNED BANGOS, OYSTER SHELL, AND BALUT

Bersamin, Silvestre V.; Gonzalez, Olympia N.; and Sulit, Jose I. (Bureau of Fisheries, Manila)
The Philippine Journal of Fisheries 3, No. 2, 85-93 (July-December 1955)

Experimental. -- This experiment followed the procedure developed by Drake et al. (1949) on the utilization of calcium in bone meal by rats. Healthy albino rats, about 28 to 30 days old and weighing about 49.9 grams each, were selected for the assay. Six groups containing 10 rats each were formed. The rats were placed in separate cages with raised screen bottoms under which paper towels were placed to prevent the loss of spilled food.

Calcium in the form of the substances to be tested was fed as a supplement of the basal diet to five of the experimental groups. A sixth or control group received a small amount of calcium probably due to the presence of casein in the diet. A basal ration devised by Robertson and Doyle (1935) was used. This ration was low in calcium, but other elements like phosphorus were normal. The salt mixture used was devoid of calcium salts. Groups I to V received the basal ration supplemented with calcium, respectively, in the form of bagoong alamang, dried alamang, canned bangos, oyster shell, and balut. These products were dried thoroughly in an oven at 70°C., and then ground to pass through a No. 40 mesh sieve. After reduction to fine powder, they were mixed thoroughly with the basal rations. All the experimental rations were prepared in sufficient quantities to last throughout the period of the experiment and kept under refrigeration.

The rations and water were given ad libitum for a period of 4 weeks, during which time an accurate record was made of the food consumed by each rat. The rats were weighed regularly every week, and observations were made daily on their health and physiological behavior. After 4 weeks, the final weights of the rats were obtained. The rats then were killed with chloroform

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ABSTRACTER: Martin Heerdt

7.80

If paper cups and plates are used in serving, care must be taken that the paper is not adding a flavor of its own to the product. The serving container also must be easy to code.

Samples must be coded so that the judges can neither distinguish the sample nor be biased by the code.

When multiple samples are judged, they should be presented in a random order to cancel out any tendency for bias caused by the order of testing.

The number of samples that may be tested at one time is debatable. Experience indicates that the number of samples a judge can handle at one time varies with the product, depending upon the intensity or type of flavor present and upon the capacity and interest of the judges participating in the test.

During judging, there should be no verbal comments or discussion of the samples. During the training period, it may be desirable to have a round-table discussion of the samples before and after judging in order to teach the judges to recognize and score certain quality factors on a common basis.

The morale or mental attitude of the judges is a vital factor in the proper functioning of every flavor panel. If judges are interrupted during their usual work, they may resent the intrusion, and this is reflected in hurried opinions and in the degree of accuracy of their remarks.

In order to maintain the interest of the judges, it is desirable to give them certain basic information concerning the importance and need for the tests being conducted.

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and dissected through the abdominal cavity to eliminate the stomach and intestines. Precautions were taken to avoid loss of blood during the dissection.

The actual weights of the carcasses were obtained and used as the basis of all calculations. After the group weights had been recorded, the dressed carcasses were placed in glass containers, covered with 3-percent acetic acid, digested for 4 hours at 15 pounds per square inch steam pressure, homogenized in a Waring Blendor, and assayed for calcium according to the method used by the Association of Official Agricultural Chemists (1945). To determine the exact calcium intake of each rat, the experimental rations were analyzed for their calcium content.

Results.--Rats that received canned bangos, dried alamang, and balut as supplements to their ration showed normal gain in weight and appeared to be in good health throughout the assay period. Rats that received canned bangos in their ration made a remarkable gain in weight throughout the assay period as compared to the other groups. The control rats and those that received bagoong alamang in their ration were apparently in poor health and exhibited only a slow gain in weight that could be attributed to a loss of appetite. Rats that received oyster shell in their ration showed a slow gain in weight at the start of the assay period and a substantial gain at the end of the experiment. Rats that received canned bangos in their ration showed the greatest gain in weight at the end of the experimental period. Following in their order were those that received dried alamang, balut, oyster shell, and bagoong alamang. Rats that received canned bangos in their ration consumed the largest amount of food.

Summary of results.-- Percentage retention of calcium by the rats for the different products tested are as follows: Canned bangos, 83.9; dried alamang, 81.0; balut, 80.9; oyster shell, 66.7; and bagoong alamang, 47.0. Canned bangos or dried alamang can be considered good dietary supplements for milk as a source of calcium. Bagoong alamang is the poorest dietary source of calcium when fed under the conditions of this experiment, although it may serve as a good source of protein and phosphorus in the Filipino diet.

6.190 (Cross Reference: 1.97)

7.89

(mercury, silver, and lead), however, do interfere, since the mercaptan ion does not exist as such in the presence of these ions, and the Hg-S bond formed does not react with the disulfide. Thus the reaction is specific only for the RS^- ion and the disulfide at the given pH.

The choice of pH was governed by the fact that PHPD slowly hydrolyzes above pH 8.0, even though the percentage of mercaptan anion formed would increase. While the rate of appearance of color at pH 8 is slow, it is appreciable and becomes apparent in 30 to 40 minutes. Where long intervals of time must be used, corrections can be made for this small amount of color that occurs with hydrolysis. The color reaction is rapid for simple mercaptans (ethyl-β-hydroxyethyl-β-alkoxyethyl-, glutathione, sodium sulfide) reaching completion in less than 10 seconds, and the color remains constant for 30 minutes.

Applications.-- The reaction was used to study serum and blood mercaptan levels. In most instances, equilibrium was achieved in 1/2 to 1 minute, though occasional samples required as much as 40 minutes. Concentrations ranged from 10 to 20 millimoles calculated from the formula:

$$C = \frac{A_{412}}{1.36 \times 10^{-4}} \quad (10^3)\ (10^3 mM) \quad = 73.6A_{412}\ (mM)$$

where C = concentration, A = absorbance, and mM = millimoles.

8.59 EFFECT OF DIET ON IMIDAZOLE COMPOUNDS AND CREATINE IN CHINOOK SALMON

Lukton, A. (University of California, Berkeley)
Nature 182, 1019-1020 (October 11, 1958)

Introduction.--Halver (1957) has recently devised highly purified diets for the chinook salmon (Oncorhynchus tshawytscha), which have been used to determine the amino-acid and vitamin requirements for this species. Since the muscle of the salmon contains both free histidine and anserine, it was of interest to determine the content of these imidazole compounds in the muscles of histidine-deficient fish. Samples of these and also of control and methionine-deficient salmon were made available to us through the courtesy of John E. Halver, U. S. Fish and Wildlife Service, Cook, Washington.

Results.--The weight of the histidine and methionine-deficient fish over a ten-week feeding period was relatively constant at 1.8 gm., whereas the control fish increased in weight from 1.8 to 3.3 gm. The skeletal muscles of four fish in each group were combined and were analyzed for histidine, 1-methylhistidine, carnosine and anserine by the ion-exchange method of Davey (1957), and also for creatine and creatinine by the method of Van Pilsum et al. (1956). Nonprotein nitrogen was determined by microkjeldahl. Results are shown in table 1 (see over).

Discussion.--Although histidine is an essential amino-acid for these fish, it is present in the muscle in relatively large amounts and, as expected in the histidine-deficient fish, a decrease occurred in its concentration. The change in carnosine concentration indicates that just as in the case of rats, in which carnosine can liberate histidine, it can replace histidine in the diet. The depleted histidine and carnosine in fish deficient in methionine suggest the possible importance of histidine as a one-carbon donor in fish. In all cases the concentration of anserine remained essentially constant.

Since histidine, either through 1-methylhistidine or carnosine, is probably the sole source of anserine, it is rather surprising that the organism, on a histidine-deficient diet, maintains its

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9.16 CONTROLLED CULTURE OF SHRIMP SEEN ON HORIZON ON A COMMERCIAL SCALE

Anonymous
Frosted Food Field 26, 1, 9, 10 (June 1958)

The controlled culture of shrimp is anticipated on a commercial scale within a few years. Shrimp culture on a large scale probably will boost the sale of frozen shrimp and will help to solve the problem of supply that shrimp processors have faced in recent years.

According to surveys, shrimp rank among the favorite foods of the American consumer. The existing consumer demand is estimated to be three to five times the present 200,000,000-pound annual supply. Although the rate of production of shrimp from trawling operations remains fairly static, the cost of catching shrimp by this method has risen steadily.

A number of organizations, including state and federal fisheries departments and universities, for the past several years have been investigating the possibility of pond culture of shrimp on a commercial scale. These groups of investigators recently banded together to form the American Shrimp Culture Association. The objectives of this association are to pool the available knowledge and form a plan of action to be followed if the current studies are successful.

Pond culture of shrimp is not a new idea. It has been practiced commercially for many years in Asia and in Italy.

One of the earliest U. S. experiments in shrimp culture was undertaken at Marineland Studios in Florida. Over a 5-month span, shrimp were grown at a rate of 1400 pounds per acre, heads-on to 26 count. The ponds had been stocked on July 8 with 145-count shrimp. These had grown to

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 ABSTRACTER: Kathryn L. Osterhaug

9.13 GLUCOSE METABOLISM IN THE CRAB, HEMIGRAPSUS NUDUS

Hu, Alfred S. L. (University of Oregon, Eugene)
Archives of Biochemistry and Biophysics 74, 387-395 (June 1958)

Introduction.--It has been reported that glucose metabolism in crustacea is different from that in other organisms. Accordingly, a study was made of the carbohydrate metabolism of the shore crab, Hemigrapsus nudus, using C^{14} labeled glucose.

Methods.-- The crabs were collected at Cape Arago, Oregon, and were fasted for at least 1 week before use. For tracer studies, glucose uniformly labeled with carbon was injected under the carapace, and the crabs were kept in sea water for the desired length of time. They then were frozen in an acetone and dry-ice bath and stored at -20° C. until used for analysis. For analysis the crabs were ground in a mortar containing dry ice and treated with 2-percent perchloric acid. The perchloric acid extract and residue were carried through a series of extractions to obtain the following fractions: (1) nucleotide, nucleoside, and oligosaccharides; (2) polysaccharide; (3) phosphate; (4) shell carbonate glycogen; and (6) chitin.

For determination of radio activity, the samples were subjected to wet oxidation, and the CO_2 collected in NaOH. The carbonate was converted to the barium salt, plated on copper planchets, and counted, using a thin-window Geiger-Muller tube.

Metabolites were identified by paper chromatographic analysis.

Results.--Radioactivity was detected in the phosphate fraction and specifically in triose phosphate, glucose-6-phosphate, and in phosphopyruvic acid. Fructose-1, 6-diphosphate, and 3-phosphoglyceric

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 ABSTRACTER: Herman S. Groninger

9.3 INSPECTION AND CERTIFICATION OF FISHERY PRODUCTS BY U. S. DEPARTMENT OF THE INTERIOR

Anonymous
Commercial Fisheries Review 20, 16-20 (August 1958)

Inspection and grading services for fishery products were transferred from the Department of Agriculture to the Department of the Interior on July 1, 1958. At the present time, there are three types of inspection services available to interested parties:

1. Continuous inspection.--An inspector is stationed at the plant whenever the plant is in operation. His duties are to check (a) plant personnel and equipment for sanitation, (b) the raw material for wholesomeness, and (c) the processing of the finished product and to select finished product samples for grading. After making the final inspection of the finished product, the inspector issues a certificate of grade for the lot. He also furnishes the plant manager with a daily report commenting on the sanitary conditions and the status of the products inspected.

The processor who makes use of this service, which costs between $7,000 and $9,000 per year, may label his product as being packed under continuous inspection.

2. Lot sampling.-- Any interested person may request the services of an inspector for the sampling, grading, or loading of a specific lot of product. Samples are drawn and examined to determine compliance to specification. An official certificate is issued denoting the grade or quality and condition of the lot. The cost of the service averages $4.50 per hour, including travel time for the inspector.

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 ABSTRACTER: Kathryn L. Osterhaug

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acid were inactive. Radioactivity was also found in the glycogen, polysaccharide, and nucleotide fractions, but not in the shell carbonate and chitin fractions. Glucose accounted for all of the radioactivity in the polysaccharide fraction. An appreciable amount of radioactivity appeared in the respiratory CO_2. At least five oligosaccharides were separated and three were identified tentatively as maltose, maltotriose, and maltotetraose (radioactivity could not be determined because of insufficient material).

Discussion. -- The results indicate that carbohydrate metabolism in the crab is not radically different from that in other organisms. The fact that no radioactivity was found in 1, 6-diphosphate and in 3-phosphoglyceric acid suggests that the analytical methods were in error or that the metabolism of the crab varies in detail from that of better known systems.

This is the first time that oligosaccharides, maltose, maltotriose, and maltotetraose have been reported to be present in an animal. The presence of the oligosaccharides may furnish a partial answer to the questions concerning the nature of the reducing substances in the blood of crustacea.

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3. Unofficial samples. -- This service consists of examining samples submitted by an interested party in the same manner as described in Lot Sampling. A certificate is issued concerning only the specific samples examined.

Labeling. -- Any packer may label his products Grade A or Grade B, providing they comply with the grades set forth in the United States standards for the product. Only on labels for fishery products that are packed under continuous inspection of the U. S. Department of the Interior, however, may "U.S." be included before the grade designation.

8.59

anserine concentration at a high level. It appears that no demethylating system is available here, just as in the case of the chick, which, on a histidine-deficient diet, maintains a constant anserine level while histidine and carnosine are progressively depleted. The variation in 1-methylhistidine is explained on the basis of anserinase activity, which has previously been suggested to be present in salmon and which has been demonstrated in cod.

Choline-deficient fish from a different experiment were also analyzed. Although the results cannot be compared directly, the very high creatine concentration of 11.3 mgm./gm. obtained is noteworthy.

Table 1. --Effect of diet on some skeletal muscle constituents of chinook salmon

Sample diet	Histidine	1-methylhistidine (μmoles/gm. wet tissue)	Carnosine	Anserine
Control	2.7	1.0	3.3	5.7
Histidine-deficient	0.3	0.4	0.4	6.1
Methionine-deficient	0.4	0.6	0.7	8.2

Sample diet	Nonprotein nitrogen (mgm./gm.)	Creatine (mgm./gm.)	Creatinine (mgm./gm.)	Imidazole nitrogen in nonprotein nitrogen (percent)
Control	3.8	4.9	0.59	17.0
Histidine-deficient	3.0	6.0	0.25	12.8
Methionine-deficient	4.2	7.1	0.31	14.0

9.16 (Cross Reference: 1.85)

57 count by August 8; they had grown to 28-count by October 11, and remained static at this weight until the following March when growth was resumed. On the 8th of March, the shrimp were 22 count to the pound, and they were 18 count on the 7th of May.

There is a total of 7,062,600 acres of marshland and inland waterway on the Gulf coasts of Florida, Alabama, Mississippi, Louisiana, and Texas. A large part of this acreage is reported to be adaptable to shrimp farming.

Shrimp farming could be combined with the production of other commodities. Schools of young fish of a desirable species could be placed in the pond with the shrimp, or the shrimp could be farmed in conjunction with the raising of rice.

A considerable amount of research, however, is necessary before shrimp farming can be put on a practical and profitable basis in the United States.

0.321 PAPER-ELECTROPHORETIC STUDIES ON FISH, CRUSTACEAN, AND MUSSEL PROTEIN

Ranke, E. and Bramstedt, F.
Arch. Fischereiwiss. 5, 43-6 (1954)
Food Sci. Abstracts 27, Abstr. No. 622 (1955)
Chemical Abstracts 52, 8410 (May 25, 1958)

Extracts were prepared from muscles of the following fish: Gadus virens, Molva vulgaris, G. aeglefinus, G. morrhua, Sebastes norvegicus, Perca fluviatilis, Abramis brama, and Cyprinus carpio; also from crustaceans: Potoamobius astacus, Crangon vulgaris, Eriocheir sinensis, and Carcinos maenas; and from mussels: Mytilus edulis and Mya arenaria. The extracts were examined electrophoretically, when fresh and after various periods of storage (up to 40 days). There were significant changes in the protein patterns from the 4th day of storage onwards; these were characteristic for each of the 3 types, fish, crustaceans, and mussels.

0.321 ON THE NATURE OF THE STREAMING BIREFRINGENCE OBSERVED IN THE AQUEOUS EXTRACTS OF SQUID MUSCLE II. DISSOLUTION OF "MYOSINS" IN THE AQUEOUS EXTRACT

Migita, Masao and Matsumoto, Juichiro J. (Tokai Regional Fisheries Research Laboratory)
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 11, 704-709 (1958) (In English)

A translucent paste (C-phase) obtained from the residue in the extraction of squid muscle with water showed a close resemblance in streaming birefringence and solubility to the streaming birefringence of proteins in the aqueous extract and "myosins."

0.38 PROTEASE IN FISH VISCERA IV. EFFECTS OF BILE ACIDS ON BILE PROTEASE OF THE STRIPED MARLIN

Suzuki, Akimi and Morio, Tadao (Nankai-ku Suiken, Kochi)
Nankai-ku Suisan Kenkyusho Hokoku 5, 165-8 (1957)
Chemical Abstracts 52, 15619 (September 25, 1958)

The protease prepared from the bile of striped marlin is activated by bile acid.

0.38 IMPORTANCE OF SEROTONIN FOR THE MELANOPHORIC REACTION OF OCTOPUS VULGARIS

Kahr, H. (II Med. Univ., Hamburg-Eppendorf, Ger.)
Naturwissenschaften 45, 243 (1958)
Chemical Abstracts 52, 16622 (October 10, 1958)

The functional occurrence of color change in O. vulgaris appears to be an antagonistic active mechanism in the melanophore between expanding nervous stimulus and contracting serotonin activity.

0.39 STUDIES ON CRYSTALLINE WHALE INSULIN III. N- AND C-TERMINAL RESIDUES

Iio, Yasuzo (Hokkaido University, Hakodate, Japan)
Bulletin of the Faculty of Fisheries, Hokkaido University 8, 238-241 (November 1957) (English summary and tables)

The dinitrofluorobenzene method and the hydrazine method were used to identify and determine quantitatively the N- and C-terminal residues of whale insulin. Phenylalanine and glycine were found to occur as N-terminal residues, whereas alanine and asparagine were found to occur as C-terminal residues. Whale insulin was estimated to have a minimum molecular weight of 5,900.

0.39 A STUDY OF THE SPECIFICITY OF THE COMPLEX FORMED BY GALLAMINE TRIETHIODIDE WITH A MACROMOLECULAR CONSTITUENT OF THE ELECTRIC ORGAN

Chagas, Carlos; Penna-Franca, Eduardo; Nishie, Keica; Garcia, Eloy Julius (Universidade do Brasil, Rio de Janeiro, Brazil)
Archives of Biochemistry and Biophysics 75, 251-259 (May 1958)

The chemical specificity of the complex formed is examined by comparing the binding property of other proteins for the curarizing substance, triiodoethylate of gallamine (TRIEG) and by testing the competition between TRIEG and various compounds similar in pharmacological properties or in molecular structure toward the binding protein isolated from the electric tissue.

The results obtained when drugs with certain pharmacological action were used tend to show that the receptor involved in curare fixation is contained in the protein solution. It may be the receptor involved in cholinergic transmission.

2.01 PRESERVATION BY LOW TEMPERATURE OF SPANISH SEA FOOD

Wojciech, R. and Varela, G. (Univ. Madrid)
Anales bromatol. (Madrid) 10, 59-128 (1958)
Chemical Abstracts 52, 14888 (September 10, 1958)

The pH, the content of Me_3N, Me_2NH, and free tyrosine-reacting substances, the peroxide number, the Walkiewicz $HgCl_2$, and Truttwin's iodometric tests were determined on lean Merluccius merluccius relatively fat Sciaena regia, Parapenaeus longirostris, and Loligo vulgaris in the raw state during storage at 6 to 12° and frozen at -18°.

2.01 ISOLATION OF LACTIC ACID BACTERIA CAUSING GREEN DISCOLORATION IN MEAT PRODUCTS

Grever, A. B. G. and Schuddeboom, L. J. (N. V. DeVereenigde Blikfabrieken, Utrecht, Neth.)
Die Fleischwirtschaft 10, 234-5 (1958)
Chemical Abstracts 52, 14020 (August 25, 1958)

Kneteman's simple method for the isolation of lactic acid bacteria with the pyrolusite agar plate, relatively unknown in meat industry, is useful in detecting causes of green discoloration in ham.

CONVERSION UNITS

1 pound = 453.59 grams
1 ounce = 28.350 grams
1 inch = 2.5400 centimeters
1 gallon = 128 ounces
1 gallon = 231 cubic inches
1 quart = 0.9463 liters
1 ounce = 29.573 milliliters

CONVERSION OF TEMPERATURE SCALES

$F = 9/5\ C + 32$

$C = 5/9\ (F-32)$

SPECIFIC HEAT AND HEAT OF FUSION

Average values of specific heat generally used for fishery products are 0.80 B.t.u. per pound per °F. above freezing and 0.40 B.t.u. per pound per °F. below freezing.

An average heat of fusion generally used for fishery products is 115 B.t.u. per pound. The heat of fusion of ice is 144 B.t.u. per pound.

DEFINITIONS

calorie ..... heat required to raise the temperature of 1 gram of water 1 degree Centigrade

British thermal unit .....252 calories or the heat required to raise the temperature of 1 pound of water 1 degree Fahrenheit

ton of refrigeration ..... removal of heat at the rate of 12,000 B.t.u. per hour

atmospheric pressure, normal .....a pressure at sea level of 14.696 pounds per square inch, absolute

sensible heat .....heat added to the body when its temperature is changed

latent heat ..... heat absorbed or evolved during a change of state, with no change of temperature

heat of fusion ..... heat absorbed when a solid melts, with no change of temperature

heat of vaporization ..... heat absorbed when a liquid vaporizes, with no change of temperature

heat of reaction ....., heat evolved or absorbed during a chemical reaction

heat transmission .....flow of heat by conduction, convection, or radiation, singly or in any combination

horsepower ..... work performed at the rate of 550 foot pounds per second

mechanical equivalent of 1 B.t.u. of heat ..... heat given off by a total expenditure of 778 foot pounds of energy

COMMON ABBREVIATIONS*

A.	Ångstrom unit(s)
a.c.	alternating current
alc.	alcohol, alcoholic
alk.	alkaline (not alkali)
amp.	ampere(s)
anhyd.	anhydrous
aq.	aqueous
at.	atomic (not atom)
at. wt.	atomic weight
Bé.	Baumé
biol.	biological
B.O.D.	biochemical oxygen demand
b.p.	boiling point
B.t.u.	British thermal unit(s)
cal.	calorie(s)
cc.	cubic centimeter(s)
cm.	centimeter(s)
d.	density (d_{13} specific gravity at 13° referred to water at 4°; d_{20}^{20}, at 20° referred to water at the same temperature)
d.c.	direct current
e.m.f.	electromotive force
Et	ethyl (Et_2O, ethyl ether)
e.v.	electron volt(s)
f.p.	freezing point
ft.	foot, feet
g.	gram(s)
γ	microgram(s)
hr.	hour
in.	inch(es)
kcal.	kilocalorie(s)
kg.	kilogram(s)
kv.	kilovolt(s)
kv.-amp.	kilovolt-ampere(s)
kw.	kilowatt(s)
kw.-hr.	kilowatt-hour
l.	liter(s)
lb.	pound(s)
m.	meter(s); also (followed by a figure denoting temperature) melts at, melting at
M.	molar (as applied to concn.)
ma.	milliampere(s)
Mc.	megacycle
mc.	millicurie
Me	methyl (MeOH, methanol)
meq.	milliequivalent
m.e.v.	million electron volts
mg.	milligram(s)
ml.	milliliter(s)
mm.	millimeter(s)
mγ	millimicrogram
mμ	millimicron(s)
mol.	molecule, molecular
mol. wt.	molecular weight
m.p.	melting point
μ	micron(s)
mv.	millivolt(s)
n	index of refraction (n_D^{20} for 20° and sodium light)
N	normal (as applied to concn.)
petr. ether	petroleum ether
p.p.m.	parts per million
ppt.	precipitate
pptd.	precipitated
pptg.	precipitating
pptn.	precipitation
qual.	qualitative (not qualitatively)
quant.	quantitative (not quantitatively)
r.p.m.	revolutions per minute
sol.	soluble
soln.	solution
sp. gr.	specific gravity
sp. heat	specific heat
sp. vol.	specific volume
sq. cm.	square centimeter(s)
U.S.P.	United States Pharmacopeia
v.	volt(s)
vol.	volume (not volatile)
w.	watt(s)
wt.	weight

* These abbreviations are used by Chemical Abstracts and, accordingly, have wide recognition.

2.9 ON THE SOURCE OF SHELLFISH POISON AT LAKE HAMANA I. ATTEMPTS AT EXPERIMENTALLY RENDERING SHELLFISH TOXIC

Migita, Masao and Kanna, Koichi
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 4, 215-221 (1957) (English summary, tables, and figures)

Oysters transplanted at the lake center, in autumn of 1951, were found to be poisonous when recovered, whereas another group of the shellfish kept for the same period of time in another part of the lake were not.

2.9 THE TOXIC SUBSTANCES ISOLATED FROM POISONOUS CUTTLEFISHES IN NIIGATA PREFECTURE I. ISOLATION OF A NEW TOXIC AMINE

Ogasawara, Nagahiro; Tamari, Kinjiro; Kaji, Jun; Nakajima, Yoshiro; and Kojima, Tetsuo (Niigata Univ.)
Niigata Daigaku Nogakubu Gakujutsu Hokoku No. 9, 79-86 (1957) (English summary)
Chemical Abstracts 52, 14013 (August 25, 1958)

Fractionation of poisonous cuttlefish homogenate with ion-exchange resins showed that the basic fraction (but not the acidic fraction) caused irritation to the auricle and the intestinal tract of guinea pigs.

3.12 FRESH FISH 1. FISH PRESERVATION BY MEANS OF ANTIBIOTICS

Nachenius, R. J. and Pienaar, A. G.
Annual Report, Fishing Industry Research Institute for April 11, 1956-December 31, 1956, Cape Town, South Africa 10, 7 (1957)

Hake that had been headed, gutted, and stored in crushed ice for 12 hours were divided into 2 lots. Hake in lot 1 were stored in plain crushed ice, whereas hake in lot 2 were stored in crushed ice containing 20 p. p. m. chlortetracycline. Hake stored in plain ice became inedible after 9½ days, whereas hake stored in chlortetracycline ice became inedible after 11½ days. A test lot of hake stored in oxytetracycline ice remained edible for 14 days.

3.12 EFFECT OF TETRACYCLINE ON FORMATION OF AMINES BY BACTERIA

Bachrach, U.; Segal, Michaela; and Rozansky, R. (Hebrew Univ.-Hadassah Med. School, Jerusalem, Israel)
Proc. Sco. Exptl. Biol. Med. 97, 874-6 (1958)
Chemical Abstracts 52, 16475 (October 10, 1958)

Formation of isoamylamine and isobutylamine by Proteus vulgaris was depressed by tetracyclines in subinhibitory concentrations; high concentrations inhibited formation of tyramine and phenylethylamine by Streptococcus faecalis.

4.11 LIPIDS OF THE MUSCLE OF TUNA, THYNNUS ORIENTALIS IV. CEPHALINS OF THE DARK-COLORED AND ORDINARY MUSCLES

Igarashi, Hisanao; Zama, Koichi; and Katada, Muneo
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 5, 278-281 (1957) (English summary and tables)

Precipitations of these fractions from chloroform with absolute ethanol yielded five groups, respectively, and indicated the presence of phosphatidyl serine, phosphatidyl ethanolamine, and a small amount of inositol-containing and threonine-containing lipids. The component fatty acids of the cephalins from dark-colored muscle consisted of palmitic, stearic, zoomaric, oleic, linoleic, and linolenic acids, whereas those from ordinary muscle consisted of only saturated and monoethylenic acids described above.

4.11 CHROMATOGRAPHIC DETERMINATION OF ISOVALERIC AND SOLUBLE VOLATILE ACIDS IN BUTTER FOR DETECTING FISH-OIL ADDITIONS I.

Canuti, Armando (Lab. chim. prov., Frosinone, Italy)
Il latte 32, 403-4 (1958)
Chemical Abstracts 52, 16638 (October 10, 1958)

Distill volatile acids from 5 grams butter, and collect 100 cc. clear distillate. Make 25 cc. alkaline with NH_3 to phenolphthalein, concentrate to 1 cc. maintaining alkalinity, and apply to 0.040 ml. of NH_3-treated chromatographic paper. Chromatograph with $BuOH-H_2O$ shaken with ammonia, dry, and spray with 0.5 percent alcohol bromocreosol solution. The R_f is 0.542 for isovaleric acid.

4.19 CONTRIBUTIONS TO THE STUDY OF MARINE PRODUCTS. XLVI. PHOSPHOLIPIDS OF A SEA ANEMONE

Bergmann, Werner and Landowne, Robert A.
The Journal of Organic Chemistry 23, 1241-1245 (September 1958)

The phospholipids of the sea anemone, Anthopleura elegantissima, have been isolated and analyzed. The principal, if not the only, representatives were sphingomyelin and plasmalogen in a ratio of twenty-to-one. The sphingomyelin consisted mainly of the N-palmityl type. The plasmalogen fraction was obtained in a high state of uniformity. Its rather small degree of unsaturation, its infrared spectrum, and the presence of only one chain of methylene groups showed the acetal attachment of the aldehyde moiety in agreement with Feulgen's original formulation.

4.19 BIOCHEMICAL STUDIES ON THE GROWTH AND MATURATION OF FISH ORGANS, I. THE VARIATION OF ETHER SOLUBLE SUBSTANCES OF OVARIES AND LIVER WITH GONAD DEVELOPMENTS IN YELLOWFIN TUNA

Higas, Shichiro and Suzuki, Akimi (Nankai-ku Sui ken, Kochi)
Nankai-ku Suisan-kenkyusho Hokoku 6, 1-7 (1957)
Chemical Abstracts 52, 14878 (September 10, 1958)

Contents of crude fat, unsaponifiable matter, cholesterol, and phosphatide in the ovary of yellowfin tuna caught in the Bashi Channel, 1953, showed a progressive increase during development to maturity, but the degree became slight after the ovum diameter reached 0.5 mm., when the amount of cholesterol and phosphatide became high.

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
		Clupea pallasii (Pacific)
Thread		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
		Cancer irroratus (New England)
Rock		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

4.29 SEPARATION OF THE WHALE-OIL ACIDS BY CRYSTALLIZATION WITH UREA

Dudkin, M. S. and Skornyakova, N. S. (I. V. Stalin Technol. Inst., Odessa)
Masloboino-Zhirovaya Prom. 24, No. 3, 19-21 (1958)
Chemical Abstracts 52, 13290 (August 10, 1958)

4.29 PREPARATION OF A COATING MATERIAL BY CHLORINATION OF FISH OIL I. ON THE PROCESS OF CHLORINATION AND PROPERTIES OF THE PRODUCT

Suzuki, Kosaku
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 1, 45-50 (1958) (English summary, figures, and tables)

To open a new use for fish oil, the author obtains by chlorination of this material a resin-like substance that seems promising as a main ingredient of a coating-like varnish. Chlorine gas is bubbled through fish oil dissolved in carbontetrachloride until no more chlorine is absorbed. The oil should be refined with alkali beforehand, because free fatty acids reduce the yield and the solidity of the product.

4.29 DIRECTED INTERESTERIFICATION OF MENHADEN OIL (BREVOORTIA TYRANNUS)

Martin, D.; Boelhouwer, C.; and Waterman, H. I.
Anales real soc. espan. fish. y quim. (Madrid) 54B, 147-50 (1958)
Chemical Abstracts 52, 15097 (September 10, 1958)

4.3 ABSORPTION OF GASES BY WHALE OILS. I. ABSORPTION OF CARBON DIOXIDE

Ishikawa, Yasutaro (Hiroshima Univ., Fukuyama)
Sci. Repts. Whales Research Inst. 11, 191-213 (1956) (In English)
Chemical Abstracts 52, 15928 (September 25, 1958)

4.3 THE SOLID CONSTITUENTS CRYSTALLIZING OUT OF CRUDE COD-LIVER OIL

Erbe, S. (Martin Luther Univ., Halle-Wittenberg, Ger.)
Pharmazie 12, 731-2 (1957)
Chemical Abstracts 52, 6719 (April 25, 1958)

The fraction of cod-liver oil precipitating at -2 to 0° consists mostly of stearin but possesses considerable vitamin A action. When this was measured in 19 samples by means of the Carr-Price reaction, the vitamin A content of stearin varied from under 50 percent to over 93 percent of that of the liquid fractions (medicinal cod-liver oil). The iodine numbers of these oil fractions were proportional to their vitamin A assays.

7.51 FISH BLOOD VIII. THE ELECTROPHORETIC SPECIFICITY OF SERUM PROTEINS

Saito, Kaname (Kagoshima Univ.)
Nippon Suisan Gakkaishi 22, 752-9 (1956-57)
Chemical Abstracts 52, 14014 (August 25, 1958)

The serum proteins of Mustelus griseus, Trachurus japonicus, Scomber tapeinocephalus, Cyprinus carpio, Squalus mitsukurii, Chrysophrys major, Decapterus muroadsi, Coryphaena hippurus, Thunnus thynnus, and Carassius auratus were examined by a Tiselius type electrophoresis apparatus.

IX. Paper electrophoretic analysis of serum proteins. --Ibid. 22, 760-7. The presence of a fraction with smaller mobility than γ-globulin was detected in marine Elasmobranchii. The non-proteinic nitrogenous substances specifically contained in large amount in sharks did not significantly interfere in the paper electrophoretic examination of the serum proteins.

7.51 ON THE PROTEIN COMPOSITION OF SQUID MUSCLE

Matsumoto Juichiro J. (Tokai Regional Fisheries Research Laboratory)
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 2, 133-139 (1958) (In English)

Squid muscle proteins were studied by the method of Dyer et al. The proteins were found to consist of 12 ~ 20 percent of nonmyosins, 77 ~ 85 percent of myosins and 2 ~ 3 percent of stroma. Subdivision of nonmyosins into myogen, myoalbumin and globulin X did not give a uniform pattern from analysis to analysis. Squid seems to resemble fishes, although properties of its myosins are distinct from those of fishes.

7.641 MICROBIOLOGICAL ASSAY OF VITAMIN B_{12} IN MARINE SOLIDS

Burkholder, Paul R. and Burkholder, Lillian M.
Science 123, 1071-1073 (June 15, 1956)

7.641 A MODIFIED PROCEDURE FOR THE ESTIMATION OF VITAMIN B_{12} IN NATURAL MATERIALS OF LOW POTENCY

McLaughlin, J. M.; Rogers, C. G.; Middleton, E. J.; and Campbell, J. A.
Canadian Journal of Biochemistry and Physiology 36, 195-201 (February 1958)

Modifications have been made in the isotope dilution assay for vitamin B_{12}, which depends on the extraction and removal of vitamin B_{12}-like factors prior to the spectrophotometric measurement. The purification procedure was effective in removing pseudovitamin B_{12} and factor A, but was ineffective in the removal of vitamin B_{12} III. Purification did not affect the estimates of vitamin B_{12} activity of milk, blood plasma, chick mash, or fish meal.

LIST OF PUBLICATIONS REGULARLY ABSTRACTED

Analyst
Analytical Chemistry
Archives of Biochemistry and Biophysics
Biochemical Journal
Biochemistry
Bulletin of the Faculty of Fisheries, Hokkaido University
Bulletin of the Japanese Society of Scientific Fisheries
California Fish and Game
Canadian Fisherman
Canadian Journal of Chemical Engineering
Canadian Journal of Chemistry
Canner and Freezer
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Processing
Chemistry and Industry
Commercial Fisheries Review
Drug and Cosmetic Industry
FAO Fisheries Bulletins
Federation Proceedings
Feed Bag
Feedstuffs
Fisheries Newsletter (Australia)
Fish. Res. Bd. Can., Prog. Repts. Atlantic Coast Stas.
Fish. Res. Bd. Can., Prog. Repts. Pacific Coast Stas.
Fishing Gazette
Food Engineering
Food Manufacture
Food Packer
Food Preservation Quarterly
Food Processing
Food Research
Food Science Abstracts
Food Technology
Frosted Food Field
Industrial and Engineering Chemistry
Industrial Refrigeration
Journal of Agricultural and Food Chemistry
Journal of Applied Chemistry
Journal of Biological Chemistry
Journal of Nutrition
Journal of the American Chemical Society
Journal of the American Dietetic Association
Journal of the American Oil Chemists' Society
Journal of the Association of Official Agricultural Chemists
Journal of the Fisheries Research Board of Canada
Journal of the Science of Food and Agriculture
Maine Coast Fisherman
Modern Packaging
Modern Refrigeration
National Fisherman
National Provisioner
Nature
Nutrition Reviews
Pacific Fisherman
Poultry Science
Progressive Fish-Culturist
Quick Frozen Foods
Refrigerating Engineering
Report of the Food Investigation Board (Great Britain)
Science
Seafood Merchandising
Trade News (Fisheries Department, Canada)
Western Fisheries
World Fisheries Abstracts
World Fishing

Articles chosen for abstracting or inclusion as bibliographical references are those deemed of interest to the commercial fisheries and to fishery technological laboratories. Occasionally pertinent articles from sources other than the above-listed publications are included. Biological papers are generally omitted.

7.80 ENZYMATIC METHOD FOR THE ESTIMATION OF FRESHNESS OF FISH I. ESTIMATION OF FRESHNESS OF FISH BY DETERMINING ACTIVITY OF SUCCINIC DEHYDROGENASE OF FISH TISSUES

Fukuda, Hironari
Bulletin of the Japanese Society of Scientific Fisheries 23, Nos. 7 and 8, 486-493 (1957) (English summary)

The activity of succinic dehydrogenase in fish organs was found to decrease with deterioration of their freshness. The author's method for the determination of succinic dehydrogenase activity with 2, 6-dichlorophenolindo-o-chlorophenol was applied to the estimation of freshness of fish. Freshness can be expressed by a "Freshness Index" value that is equal to the succinic dehydrogenase activity per gram of fresh tissue.

II. Relationship between freshness of fish and succinic dehydrogenase activity. -- Although great variations in the enzymatic activity were observed among various tissues, a decrease in the enzyme activity of a certain sample tissue showed a significant correlation with its decrease in freshness.

7.80 THE DETERMINATION OF HEXAMETHYLENTETRAMINE IN FISH PREPARATIONS

Böger, G. (VDK Zentrallab., Halle/Saale, Ger.)
Pharm. Zentralhalle 95, 61-3 (1956)
Chemical Abstracts 52, 12262 (July 25, 1958)

Distill 50 grams of fish products after addition of 200 ml. H_2O and 5 ml. concentrated H_2SO_4. Mix 10 ml. of distillate in a test tube of 2.5 cm. diameter with 1 ml. concentrated H_2SO_4 and 5 ml. of reagent. In 20 minutes a blue-violet color develops; the intensity depends upon concentration.

7.81 ON THE DETERMINATION OF TRIMETHYLAMINE AND TRIMETHYLAMINE OXIDE . A MODIFICATION OF THE DYER METHOD

Hashimoto, Yoshiro and Okaichi, Tomotoshi (Faculty of Agriculture, Tokyo University)
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 5, 269-272 (1957) (English summary, figures, and tables)

The extraction of trimethylamine (MTA) with toluene was found to be affected by temperature, kinds of alkali, and amount of shaking; whereas the color development of TMA with picric acid was not influenced by temperature. As a result the extraction was made at 30° C. and with a 25 percent potassium hydroxide solution instead of a 50 percent potassium carbonate solution. These modifications gave 97 percent recovery of trimethylamine oxide and the recovery of as little as 0.025 mg. N.

7.81 THE PUTREFACTIVE PRODUCTS OF FISH TISSUES I. TURBIDITY IN COLORIMETRIC DETERMINATION OF TRIMETHYLAMINE BY DYER'S METHOD

Saito, Kaname and Sameshima, Muneo (Univ. Kagoshima)
Nippon Nogei-Kagaku Kaishi 30, 531-4 (1956)
Chemical Abstracts 52, 8409 (May 25, 1958)

Turbidity which hinders Dyer's colorimetric determination of trimethylamine (Dyer, C. A. 40, 29017) could be removed by adding $Hg(AcO)_2$ to the original sample solution at neutral pH and filtering.

II. Isolation and identification of cadaverine. --Ibid. 535-7. Cadaverine was isolated from staled fish tissues as picrate. As the addition of synthetic cadaverine caused turbidity in the determination of trimethylamine, it was concluded that cadaverine was the cause of the turbidity.

8.51 CHEMICAL COMPOSITION OF SOME MUCUS SUBSTANCES OF FISH

Wessler, Erland and Werner, Ivar (Univ. Uppsala, Swed.)
Acta Chem. Scand. 11, 1240-7 (1957)
Chemical Abstracts 52, 14016 (August 25, 1958)

In all species examined, the main constituents of the mucus was protein with the same amino acid pattern, except that of the ray, which contained no tyrosine.

8.51 AMINO ACID COMPOSITION OF THE MUSCLE EXTRACTS OF AQUATIC ANIMALS

Ito, Keiji
Bulletin of the Japanese Society of Scientific Fisheries 23, Nos. 7 and 8, 497-500 (1957) (English summary and tables)

Seventeen amino acids in the aqueous alcoholic extracts of several marine animals, four species of fish, and two species of molluscs, were determined after hydrolysis by the microbiological method.

8.51 HEMOGLOBIN CONTENT OF BLOODS OF NUMEROUS SPECIES OF MARINE FISH

Gelineo, Stefan (Oceanographic Inst., Split, Yugoslavia)
Compt. rend. soc. biol. 151, 1594-7 (1957)
Chemical Abstracts 52, 14875 (September 10, 1958)

Values for 27 species (named) from the Adriatic Sea ranged from 1.3 to 15.7 grams hemoglobin per 100 cc. of blood.

8.51 CONTENT OF MYOSIN FRACTION IN FISH MUSCLE

Miyake, Masato and Hayashi, Koichi (Prefectural Univ., Mie)
Rept. Fac. Fisheries, Prefect. Univ. Mie 2, 470-2 (1957) (In English)
Chemical Abstracts 52, 15775 (September 25, 1958)

The amount of myosin fraction in fish meat of 21 marine species determined by the method of W. J. Dyer, et al. (C. A. 44, 4528g) was found in the range of 8.76 to 63.13 percent in dry matter.

8.51 BLOOD PROTEINS OF THE DOGFISH, SCYLLIUM CANICULA, AND THE INFLUENCE OF FASTING

Cordier, D.; Barnoud, R.; and Brandon, A. M. (Univ. Lyon, France)
Compt. rend. soc. biol. 151, 1912-15 (1957)
Chemical Abstracts 52, 15757 (September 25, 1958)

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8.59 LINGCOD MUSCLE PURINE NUCLEOSIDE PHOSPHORYLASE

Tarr, H. L. A. (Fisheries Research Board Can., Vancouver)
Can. J. Biochem. and Physiol. 36, 517-30 (1958)
Chemical Abstracts 52, 14017 (August 25, 1958)

A purine nucleoside phosphorylase enzyme preparation was isolated from muscles of the lingcod (Ophiodon elongatus).

8.59 THE PRESERVATION OF FISH. ENZYMIC TOPOGRAPHY OF VARIOUS SPECIES

Alfonso, Cristino Garcia and Bertran, Enrique Castella
Anales inst. invest. vet. (Madrid) 6, 129-44 (1954) (English and German summaries)
Chemical Abstracts 52, 12256 (July 25, 1958)

8.59 CHOLINESTERASE ACTIVITY OF FRESHWATER FISH

Clos, F.; Serfaty, A.; and Cathala, Mlle
Bull. soc. hist. nat. Toulouse 92, 205-17 (1957)
Semaine hop. 35, 1647-52 (1950)
Chemical Abstracts 52, 12255 (July 25, 1958)

8.610 FORMATION OF ANHYDROVITAMIN A_1 IN THE STUDY OF VITAMIN A_1 ISOMERS

Barnholdt, B. (Statens Vitamin-Lab., Copenhagen)
Acta Chem. Scand. 11, 909-11 (1957)
Chemical Abstracts 52, 14082 (August 25, 1958)

The formation of anhydrovitamin A_1 was studied spectrophotometrically at 25 to 26°. HBr and HCl in absolute EtOH give the same rate of dehydration but H_2SO_4, HOAc, and p-HSO_3-C_6H_4Me give slower rates. Water is detrimental. HCl is considered the best catalyst.

8.610 RETINAL PIGMENTS OF A LABRID FISH

Munz, Frederick W. (Dept. of Zoology, University of California, Los Angeles)
Nature 181, 1012-1013 (April 5, 1958)

9.14 GOOD NEWS FOR FISH HATCHERIES AND FISHERMEN

Anonymous
Chemical Week 83, 69 (November 15, 1958)

A study of streams and lakes has shown the influence of geological formations on the ability of drainage waters to support fish life. Because the presence of lime facilitates the release of nutrients to be built into plants, it was found that hard waters from sedimentary areas are up to 50 times more productive than the soft waters of the igneous rock areas. Bacteria count appears to be related to calcium and carbonate supplies in the water and, since bacteria are basic to food cycle in restoring nutrient salts to water, they may, too, be related to productivity. By adding calcium carbonate, fish yield per acre may be increased.

9.14 NUTRITION OF SALMONOID FISHES VI. PROTEIN REQUIREMENTS OF CHINOOK SALMON AT TWO WATER TEMPERATURES

DeLong, Donald C.; Halver, John E.; and Mertz, Edwin T. (U. S. Fish and Wildlife Service, Cook, Washington)
The Journal of Nutrition 65, 589-599 (August 10, 1958)

The data presented suggest that the optimum protein level for chinook salmon is dependent upon water temperature. The requirement at 47° F. was found to be 40 percent of the diet and the requirement at 58° F., 55 percent of the diet. The feeding tests also show that the protein requirements of fish are two to four times higher than those of birds and mammals, when expressed as a percentage of the dry diet.

9.6 SELECTED REFERENCES ON THE CHANNEL CATFISH, ICTALARUS PUNCTATUS

Riggs, Carl D. (University of Oklahoma, Norman)
Special Scientific Report: Fisheries No. 235, 10 pp. (February 1958) (U. S. Fish and Wildlife Service, Washington 25, D. C.)

9.6 THE PHYSIOLOGY OF FISHES I. METABOLISM

Anonymous
Archives of Biochemistry and Biophysics 74, 293 (March 1958) (Book review)

Volume I has chapters on aquatic respiration of fish by F. E. J. Fry, air-breathing by G. S. Carter, the cardiovascular system by J. C. Mott, the alimentary canal and digestion by E. J. W. Barrington, excretion and osmoregulation by Virginia Safford Black, the skin and scales by John Van Oosten, endocrine organs by William S. Hoar, the gonads and reproduction by William S. Hoar, early development and hatching by Sydney Smith, experimental studies on growth by M. E. Brown, and the biochemical composition of fish by R. M. Love. Each chapter has an extensive bibliography.

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